THE IRON AGE

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Steel Trade Now Looks to 1928 to Compensate for Some of the Recession of 1927—Forces That May Make for Greater Market Stability

¶ *Nineteen twenty-seven in the steel industry showed early signs of falling behind* 1926. *With a steel ingot output of about* 43,250,000 *tons, it was* 8 *per cent under the* 46,936,000*-ton peak of the year before.*

¶ *Prices declined most of the year, and earnings were quite below those for* 1926, *in spite of the signs a year ago that steel companies were about to curb price cutting.*

¶ THE IRON AGE *composite price for finished steel averaged* 2.357*c. per lb. for the year; it was* 2.439*c. in* 1926. *Thus the year's average fell off* $1.64 *a net ton, whereas the* 1926 *average was only* 52*c. a ton under that of* 1925.

¶ *In the sheet and strip trades the revolution of continuous rolling by patented methods made the year memorable, pointing to ultimate centering of production in large companies.*

¶ *Pig iron last year sold lower than at any time since August,* 1916. *Our pig iron composite, as the year opened, was* $19.71 *per ton, and at the year's end* $17.54. *Pig iron output was about* 36,400,000 *tons; in* 1926 *it was* 39,373,000 *tons.*

¶ *With outlay for new iron and steel plant much curtailed and with production in fewer hands, the trend is toward a more stable market.*

MORE factors in the steel trade outlook for 1928 are difficult to estimate than was the case at the beginning of 1927, or of 1926 or 1925. Yet there are good reasons for the expectation that it will be a year of large activity and, barring untoward developments of which present tendencies give no sign, conforming in the main to a composite of the three years last past. Wide fluctuations from year to year are no longer likely. Counting 58,000,000 tons of ingots as theoretical capacity, 1926 was an 81 per cent year and 1927 a 74.5 per cent year.

One year ago it was said in THE IRON AGE's forecast that the expectations of the steel trade as it entered 1927 were not so high pitched as at the beginning of 1926, but that almost without exception there was the added opinion that no important recession was likely in the twelve-month. It was felt that since 1926 had outrun the high record of 1925, making two successive peak years, it would be breaking all precedents (apart from the war-time triennium 1915, 1916 and 1917) to have a new top in 1927.

Also there was warrant for the view that 1926 had brought some over-expansion of trade for which a compensating toll might be taken from 1927. The automobile industry was particularly in mind in this connection, but the recession there proved to be more than was looked for, due largely to the protracted suspension of production by Henry Ford.

Possible Compensations in 1928

Today, following the reasoning of a year ago, there is ground for the view that, as 1927 showed a recession from the very high peak of 1926, some

lines of steel consumption may be expected to compensate in 1928 for what they lacked in the year just ended. Automobile and railroad demand, alike disappointing in 1927, are both counted on for increases, and the improvement agricultural machinery plants had in 1927 promises to go further. Steel construction in heavy lines need not be expected to exceed, and may not equal, the large scale of 1927. The pipe trade looks forward to another year substantially like 1927 in falling short of the peak consumption of 1926.

Is Greater Market Stability in the Making?

Reading consecutively at the year-end the weekly market reviews of THE IRON AGE for 1927 one sees that it was a year in which improvement in steel prices and consumption was constantly expected but not realized. Yet several things have been in the making, even in these past nine months of recession, that may turn out on the side of price betterment in 1928.

First, is the series of efforts producers have made to get various finished products out of the low-price ruts. While the extent of their success is largely for the future to determine, these efforts have kept constantly before both sellers and buyers the aim of the manufacturers to get prices yielding a fair profit and have tended to lessen the strain for tonnages at the expense of prices.

CONSOLIDATION TENDENCY MORE PRONOUNCED

In the second place, progress has been made in the direction of consolidation in the past year, reducing to that extent the scramble for profitless tonnage. Following the merger in July, 1926, of the Central Steel Co., Massillon, Ohio, and the United Alloy Steel Corporation, Canton, Ohio, with combined ingot capacity of 1,150,000 tons a year and assets of $80,000,000, there were persistent reports of further concentration of steel capacity in northern Ohio. The Otis, Corrigan-McKinney and Trumbull companies were commonly mentioned in connection with these plans. The expected amalgamation did not come, however, but in November the Republic Iron & Steel Co. acquired the Trumbull Steel Co., bringing the ingot capacity of the former up to 1,900,000 tons a year.

In July the American Rolling Mill Co. purchased the properties, business and patents of the Columbia Steel Co., Butler, Pa., the combined capacity of the two companies being 1,000,000 tons of sheets and stripsheets a year.

Negotiations have been under way for some time which are expected to bring about the early merger of the Columbia Steel Corporation and the Pacific Coast Steel Co., both of San Francisco, and having gross assets above $35,000,000.

On the last day of the year announcement was made that the Youngstown Sheet & Tube Co. would acquire the Inland Steel Co., the strong Chicago district independent, which Eastern steel interests had more than once sought to acquire with its ingot capacity of more than 1,500,000 tons. Then in northern Ohio a merger of six sheet and tin-plate producers was consummated in December and the Empire Steel Corporation was formed—a move that should aid in the effort to save the sheet industry from disastrous price cutting.

LITTLE NEW CAPACITY BUILDING

A third factor making for more stability in the industry is the limited scale of the additions made last year, or planned for this year, to the country's steel-making capacity. In the four years after it acquired the Midvale and Lackawanna companies the Bethlehem Steel Corporation spent $80,000,000 on new construction and improvements to increase output. The Steel Corporation appropriations in 1924, 1925 and 1926 were $75,000,000 for the building of new capacity. The past year has shown a sharp falling off in new construction; in the coming year relatively little will be done. Excess capacity will be less in evidence and demand will grow into healthier relation to supply.

A fourth constructive development of the year was the beginning of continuous sheet manufacture on a large scale. While, on its face, continuous sheet and strip rolling suggests destructive competition and the eventual elimination of smaller mills, there are indications that the patent situation will be so handled by the granting of licenses that the continuous mill may tend rather to the stabilizing of the very important market for the thinner products.

Unbalanced Steel Demand Last Year

The forecast of some leading members of the steel trade that demand in 1927 would run something like 10 per cent less than in 1926 turned out to be fairly accurate. Ingot production, as indicated on the preceding page, was about 8 per cent below that of 1926. When we consider the lack of railroad equipment buying, the slump in automobile production, the depression in the oil fields, the bituminous coal strike, the Mississippi flood, and the widespread handicap of unseasonable weather, the 1927 performance of the steel industry was remarkable. With the railroad, automobile and oil demands so unsatisfactory as all were last year it is evident that the miscellaneous and unclassified industries furnished nearly as much business as in 1926.

New uses of steel are adding to each year's demand. Steel furniture, steel sanitary equipment, steel sash and steel frame dwellings are examples. The steel requirements for craft on the Monongahela, Ohio and Mississippi Rivers are increasing. Perhaps 70,000 tons was so taken in 1927. The work of the Sheet Steel Trade Extension Committee no doubt prevented a considerable falling off in sheet consumption. The revolution in farm equipment brought on increased use of steel from that quarter last year and this promises to be greater in 1928.

SMALLEST STEEL REQUIREMENTS FOR NEW CARS SINCE 1921

Capital expenditures by the railroads were only $750,000,000 in 1927, or more than 15 per cent below those of 1926, and the decrease was reflected in nearly all steel purchases except rails. The number of freight cars ordered for domestic steam railroad use was 71,606, including those authorized for construction in railroad companies' own shops. While this was a slight gain over the 67,000 bought in 1926, it fell considerably below 78,000 ordered in 1925 and 135,000 in 1924.

A closer gage of the decline in actual steel consumption for freight cars last year is afforded by the total of 63,390 cars built and delivered by car builders and railroad car shops, 1927 being the least active year in this respect since 1921. In the preceding year 79,000 were built, while 94,000 was the total for 1925 and 104,000 for 1924.

Only 808 locomotives were ordered during the year, including export orders, and 1176 were built. Of those ordered 696 were for domestic use, as against 1301 in 1926, while 958 were built for domestic use compared with 1585 in 1926.

Railroads built 779 miles of new main line, but tore up 202 miles, leaving a net gain in trackage of 577 miles.

FABRICATORS' ORDERS MORE BUT SHIPMENTS LESS

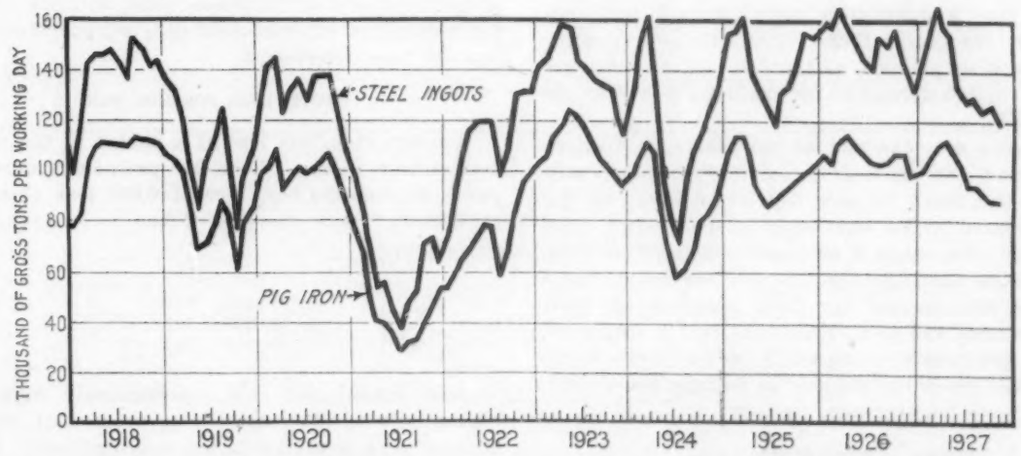
A high rate of building construction is reflected by the figures collected by the Department of Commerce on 1927 contracts for fabricated structural steel. Computed bookings, based on returns from a large percentage of the fabricators, showed a total of 2,521,740 tons for 11 months and, with December estimated, the

year will show approximately 2,725,000 tons, a gain of a little less than 8 per cent, compared with 2,523,250 tons in 1926 and 2,425,612 tons in 1925. Shipments last year ran more than 200,000 tons below those of 1926; in that year shipments exceeded orders.

Elsewhere the automobile, railroad, new construction and oil well and pipe line consumption of steel in 1927 is referred to, each field having a separate article. The estimate of motor cars and trucks built in the United States last year is 3,350,000, as against 4,255,000 in 1926.

Output Curve Had No Autumn Upturn

On page 3 the course of steel production last year is shown in a curve which is in contrast with those of the previous three years. All advance in the early months of the year to a March peak, then decline in spring and summer, ascending again in the autumn. The 1927 curve, however, did not turn up last fall and in that particular, as in others, it paralleled the movement of 1923. Indications now point to a continuation of the parallel, which would give in the next three months some such increase in operations as was seen in the first quarter of 1924, and was repeated in each of the three following years.



Fluctuations in Daily Average Production of Steel Ingots and of Pig Iron, During the Past Ten Years. While generally parallel, the curves are farther apart than formerly, much farther than in 1921, for instance. They are based on monthly ingot figures of the American and Steel Institute and monthly pig iron figures gathered by THE IRON AGE. *Ingots have fallen far below the high record of 1926 but the year was above the 1923-1926 average. Pig iron is 2 per cent below the average of those four years*

The year's steel ingot output THE IRON AGE estimates at 43,250,000 gross tons and that of steel castings at 1,250,000 tons (against 1,300,000 tons in 1926), making the 1927 total of ingots and steel castings about 44,500,000 tons, which compares with 48,294,000 tons in 1926.

March a Record Month in Steel

Outputs of steel ingots and pig iron are given below for 1927 and the preceding 10 years, including the last two years of the war period:

	Pig Iron, Gross Tons	Steel Ingots, Gross Tons	Steel Ingots and Castings, Gross Tons
1917	38,621,216	43,619,200	45,060,607
1918	39,054,644	43,051,022	44,462,432
1919	31,015,364	33,694,795	34,671,232
1920	36,925,987	40,881,392	42,132,934
1921	16,688,126	19,224,084	19,783,797
1922	27,219,904	34,568,418	35,602,926
1923	40,361,146	43,485,665	44,943,696
1924	31,405,790	36,811,157	37,931,939
1925	36,700,566	44,140,738	45,393,524
1926	39,372,729	46,936,205	48,293,763
1927	36,400,000	43,250,000	44,500,000

On April 1, union miners in the bituminous coal fields struck to enforce their demand for the maintenance of the so-called Jacksonville scale and the strike lasted through the year except for a tentative adjustment in the Illinois district. Stocks of coal had been accumulated before the strike and non-union mines increased their operations to such an extent that there was a plentiful supply of coal throughout the year. Iron and steel production were in nowise affected by the strike and at no time did the market for coal and coke show strength.

Last year has the distinction of the largest ingot output ever made in a month—4,499,092 tons in March. The scarcely interrupted decline in the daily rate of steel ingot production that began in April is shown below in the statistics of the American Iron and Steel Institute:

Months, 1927	Daily Production, Gross Tons	Months, 1927	Daily Production, Gross Tons
January	144,611	July	127,134
February	157,557	August	128,552
March	166,633	September	124,312
April	157,494	October	126,500
May	157,430	November	119,299
June	133,387	December	.....

A Hard Year for Pig Iron Producers

In pig iron production, 1927 ranks eighth among the high years, having been exceeded by 1916 and by every year in the succeeding decade except 1919, 1921, 1922 and 1924. We estimate the year's production (including charcoal iron, which is not included in the monthly statistics) at 36,400,000 tons. This compares with 39,372,729 tons in 1926.

The table below gives the number and capacity of furnaces in blast at the beginning of each month. The largest number was 223 on April 1, with a daily capacity of 113,435 tons, and the smallest, 170, on Dec. 1, with a daily capacity of 87,700 tons:

1927	Number In Blast	Daily Capacity Gross Tons	1927	Number In Blast	Daily Capacity Gross Tons
Jan. 1	203	98,360	July 1	198	100,240
Feb. 1	208	100,635	Aug. 1	190	93,700
March 1	217	106,135	Sept. 1	187	92,800
April 1	223	113,435	Oct. 1	179	90,800
May 1	220	112,955	Nov. 1	172	88,300
June 1	211	107,445	Dec. 1	170	87,700

Pig iron production of about 36,400,000 tons (December estimated) in 1927 (including charcoal iron, ferro-

manganese and spiegeleisen) was the smallest since 1924 and was exceeded in seven preceding years—1916, 1917, 1918, 1920, 1923, 1925 and 1926. Last year's output fell almost 10 per cent below the peak of 40,361,146 tons in 1923.

On Jan. 1, 1927, there were 204 furnaces in blast, while on Dec. 1 the number had declined to 170. Shutting down came rather rapidly in the last half of the year, reflecting not only the diminishing demand for steel, but smaller consumption by iron and steel foundries.

MORE FURNACES ABANDONED

The year brought further scrapping of obsolete furnace capacity, resulting in a net loss of 14 stacks. THE IRON AGE list of Jan. 1, 1927, showed 371 units as against 357 now. Of the 357 existing furnaces, 122 may be definitely rated as in the merchant class. Only 39 of the 122 were in blast on Dec. 1, and many of those which were not then in blast had been idle for the entire year, and doubtless many will go to the scrap heap before the end of 1928. Very little new capacity is being built or planned, so that the end of this year will see a further decline in the country's potential pig iron capacity.

Each year sees the end of the merchant furnace drawing near, and the time is coming when practically all of the iron made for sale will be furnished by the steel companies. The expansion of by-product coke oven capacity has made it necessary for the steel companies to keep blast furnaces going to use up the coke, and it has been cheaper for these companies to keep on making coke and iron, sometimes far in excess of their own requirements, especially in the large, modern furnaces which are capable of making 800 or 900 tons daily over long-extended periods.

PRICES LOWEST SINCE 1916

Pig iron prices showed the lowest year's average since 1916, THE IRON AGE composite price for 1927 averaging $18.55 against $20.42 in 1926, $20.58 in 1925 and $20.90 in 1924. Several months in 1916 had averages below $18. The 1927 composite was more than $7 per ton below the composite average of the eight years, 1919 to 1926, inclusive.

A significant development of the year was the growth of water shipments, together with the invasion of new territories by some furnace interests which would have been wholly at a disadvantage when shipping by rail. The Chicago district was invaded on several occasions by iron from Lake Erie ports. Large shipments from Buffalo were also made to the Detroit district.

EASTERN WATER SHIPMENTS

During the navigation season, shipments of Buffalo iron by New York State barge canal to New York, New Jersey and Connecticut points were more frequent than in preceding years, as Buffalo producers reached out for more territory to offset their loss of business in New England due to the extreme competition of Everett, Mass., Troy and Port Henry, N. Y., furnaces for that market. The Mystic furnace at Everett shipped tens of thousands of tons by barge to cast iron pipe foundries on the Delaware River above Philadelphia, thus competing actively with eastern Pennsylvania furnaces.

Lake Erie furnaces, which for most of the year were making more iron than could be absorbed in their natural territories, reached out to points where they were at a freight rate disadvantage, and in the Cincinnati district they undersold southern Ohio furnaces.

Southern iron, which was held at fairly high prices most of the year, lost some of its northern markets, but late in the year, when the Alabama producers reduced their quotations to the lowest point, with one exception, since October, 1916, they widened their markets somewhat in the territory contiguous to the Ohio River. They did not regain the opportunity, however, to ship iron in sizable quantities to points north of Cincinnati and St. Louis.

CHANGES IN OWNERSHIP

Among the changes of the past year was the acquisition of the Rogers-Brown furnaces at Buffalo by the M. A. Hanna Co., Cleveland. Another major transaction was the purchase of the Hamilton furnace at Hamilton, Ohio, by the Koppers Co. and the American Rolling Mill Co. This furnace will supply hot metal for the latter company's steel plant at Middletown, Ohio, as soon as a connecting railroad can be built. Interests affiliated with the American Rolling Mill Co. also bought the Norton furnace, long a factor in the merchant iron market of southern Ohio, and when modernized it will supply hot metal to the American Rolling Mill Co.'s Ashland, Ohio, plant. The two furnaces of this company at Columbus, Ohio, will not be needed for production of steel-making iron, but their future has not been determined.

MUCH LESS FOREIGN IRON

Foreign iron was less of a factor in the domestic market than in any of the five preceding years. Last year's receipts did not exceed 140,000 tons (last month estimated), while those of other recent years were as follows:

	Tons		Tons
1922	383,445	1925	441,425
1923	367,778	1926	445,773
1924	209,109	1927	118,769 (11 months)

Low prices here and comparatively high prices abroad left so little margin of profit that American brokers were unwilling to buy speculatively. A slight deterrent was the advance of 50 per cent in the tariff, from 75 cents per ton to $1.12½, under the flexible provisions of the tariff act, and a further retarding factor was the application of the anti-dumping duty on German pig iron after an investigation by the Treasury Department.

Scrap Had Small Fluctuations

Low cost of making pig iron in principal steel producing districts has served to keep down prices of heavy steel scrap, but other factors have also been at work, such as reduced consumption and the increased efficiency of the railroads, not only in gathering their own scrap but in transportation from all shipping points. The speculative profits of past years for handlers of scrap have been lacking, as prices of all grades have moved over a very narrow range. THE IRON AGE composite price of heavy melting steel for 1927, taking Pittsburgh, Chicago and Philadelphia markets as the bases, was $14, compared with $15.48 in 1928 and with an eight-year average of $17.35.

Efforts to Steady Prices

Prices had a good deal of attention throughout the year, nearly every product apart from rails having consideration in the effort of producers to stabilize the market. Strip makers announced an advance in February, but previously gave buyers full coverage for the second quarter at the low prices reached just after the turn of the year, and it took until well into the third quarter to complete the shipments on these protections.

In sheets an effort was made to limit the coverage given before an advance announced in the latter part of May. Buyers were given until June 30 to specify at the low prices, but in many cases the period was extended. The outcome was that no great amount of the announced advance was realized upon.

On Nov. 10 the Carnegie Steel Co. advanced plates, shapes and bars $1 a ton, or to 1.80c., Pittsburgh, but

there was very general coverage well into the first quarter at the 1.75c. price.

In tin plate a reduction from $5.50 to $5.25 a box was made in December in the contract price which had nominally prevailed for three years. The new price was really an advance over some prices that had commonly been made, and it was announced that it would not be subject to concessions to the extent that had long been practiced.

Wire prices were the subject of an effort to raise the market, but by the end of the year producers had lost the ground that appeared to have been gained.

Generally speaking, it was a year of price weakness, and the average of THE IRON AGE'S quotations on seven leading finished steel products was $1.64 per net ton below that of 1926.

Pig iron prices, as appears from the pig iron review on a preceding page, were the lowest since 1916.

Exports Increase While Imports Decrease

Following up the gain made in exports in 1926, there was a further moderate addition to the iron and steel shipments from the United States to foreign countries in 1926. Figures for 11 months show a total of 2,012,541 gross tons, against 1,969,022 tons (11 months) a year earlier. It is true that this increase was accounted for wholly by large exports of scrap which in 11 months of 1927 exceeded the 1926 figure by 118,600 tons. Other products flowed outward in good volume, however, with varying changes from the preceding year.

Increases of 19,000 tons in tin plate, 3000 tons in wire, 25,000 tons in pig iron, and 118,600 tons in scrap were partly offset by decreases of 24,000 tons in bars, 5000 tons in plates, 19,000 tons in galvanized sheets, 12,000 tons in steel sheets, 3000 tons in hoops, bands and strip steel, 2000 tons in wire rods, 20,000 tons in structural material, 8000 tons in rails, 7500 tons in rail fastenings, 16,000 tons in boiler tubes, and 2500 tons in wire nails.

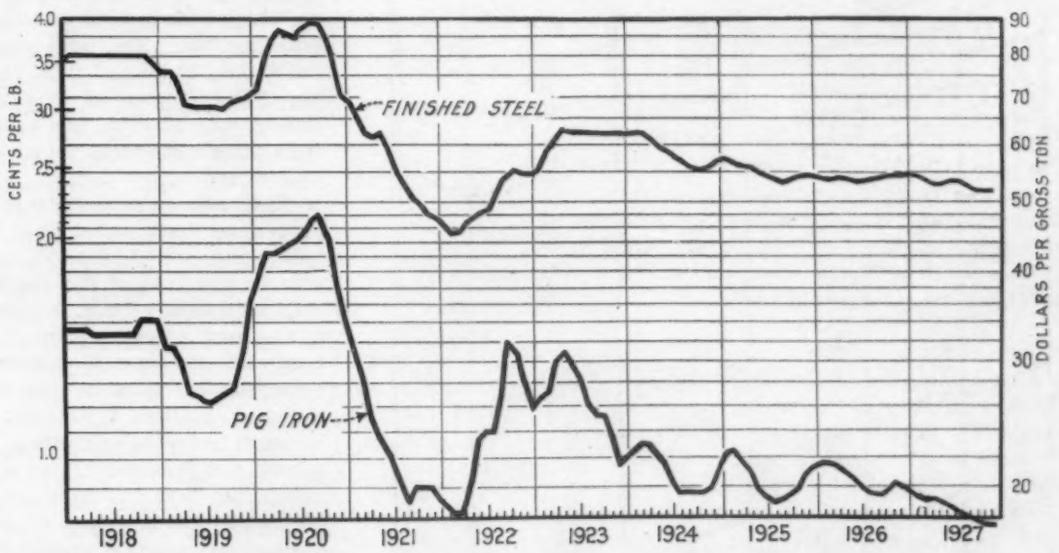
IMPORT DECLINE LARGELY IN PIG IRON

Meantime imports have shown a 34 per cent shrinkage—from 1,034,583 tons in 11 months of 1926 to 686,279 tons a year later. Nearly all of this falling off is accounted for by pig iron and scrap; together they showed a drop of 336,000 tons. Pig iron was 42 per cent of the 1926 total, and only 17 per cent in 1927.

Increases in imports of rolled products were considerable in 1927, though there was a decline of 46,000 tons in rails. Some of the increases were: 7700 tons of wire rods, 37,000 tons of structural shapes, 5400 tons of sheets, 6000 tons of hoops, bands and cotton ties, and 22,600 tons of wrought pipe. There was a decline in steel bars to the extent of 14,000 tons. Ingots, blooms, billets and slabs dropped over 50 per cent, or by more than 17,000 tons.

WHERE THE CHIEF EXPORTS WENT

As has been the case for many years, Canada was the largest buyer of our products last year, taking 38½ per cent of the total against 39 per cent in 1926. Shipments to Canada declined 11,000 tons to 771,197 tons in the first 11 months of 1927. Japan took more from us last year than in the preceding year by about 10 per cent. The total in 11 months went up to 251,153 tons, or 12½ per cent of all our exports. No other country, aside from these two, took as much as 100,000 tons.



Fluctuations Over Post-War Years in THE IRON AGE *Composite Prices of Pig Iron and Finished Steel. The relative stability of finished steel prices, when compared with pig iron, continues to be demonstrated. The highest finished steel composite figure during 1927 was 7 per cent above the lowest; in pig iron the divergence was 12.4 per cent. Since the peak early in 1923, both trends have been downward. Finished steel has lost 18 per cent and pig iron 43 per cent*

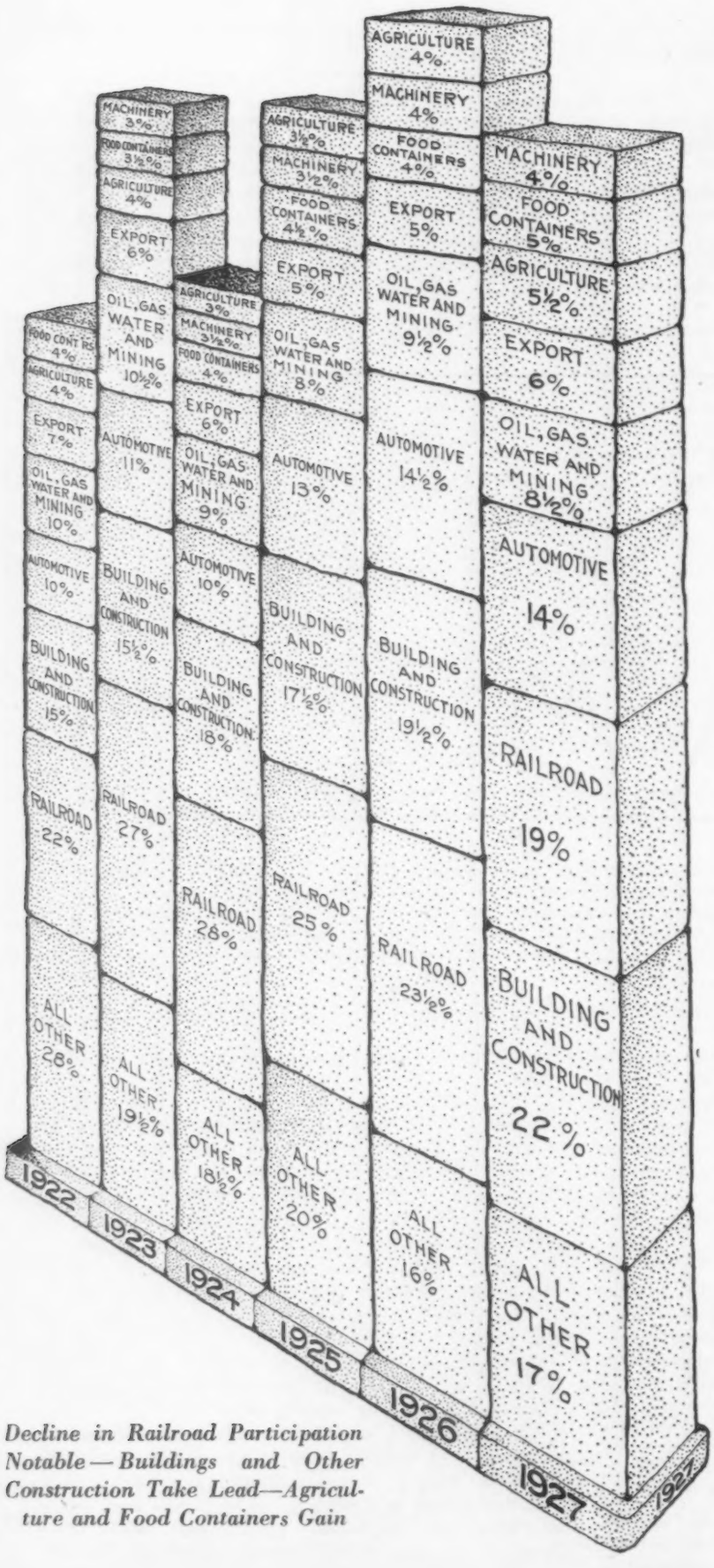
Cuba (87,480 tons) was in third position, with Argentina (75,465 tons) and Mexico (75,361 tons) following close together in fourth and fifth. In 1926 Mexico was third and Cuba fourth. Other countries taking upward of 50,000 tons in the first 11 months of last year were Brazil, Colombia, Great Britain and the Philippine Islands. China took a little more than 49,000 tons. Chile and Venezuela were beyond the 50,000-ton mark in 1926 but dropped well below it last year.

Rolled steel accounted for about 83 per cent of our exports last year, as in the year before. In imports rolled material made a heavy advance over preceding years, reaching about 57 per cent of the aggregate, compared with 35 per cent in 1926.

Belgium had a large lead as the source of imports in the first 11 months of the year, with a total of 185,939 tons. France, in second position, sent 125,411 tons, followed closely by Germany, with 121,829 tons. Other countries were far below. Canada sent 68,871 tons; India, 59,108 tons; Great Britain, 50,328 tons; Nether-

(*Concluded on page* 110)

What Steel Was Made and Where



Decline in Railroad Participation Notable — Buildings and Other Construction Take Lead — Agriculture and Food Containers Gain

SUBSTANTIAL gains in production of structural shapes and wire in 1927 were more than offset by losses in other products. As a result the year fell nearly 8 per cent behind 1926 in rolled steel output. Steel bars recorded the most notable drop—over 800,000 tons, or 30 per cent of the total decline of 2,743,000 tons.

Production is estimated at 32,039,000 gross tons, compared with 34,782,000 tons in 1926 and 32,660,000 tons in 1925. The total was above the 31,580,000 tons of 1923, but below the 33,068,000 tons of 1917 and 32,380,000 tons of 1916. No year, aside from those mentioned, has equaled the 1923 figure.

Estimates on production are based on returns from rolled steel makers accounting for 30,554,000 tons, or over 95 per cent of the year's total. This high rate affords further proof of the spirit of cooperation of the industry in providing, in confidence, information of value to the common cause. Less than 5 per cent of the industry had to be estimated. Consequently the dependability of the total figures has been improved over those of years of less abundant returns.

Moreover, a larger proportion than ever before provided detailed classification of distribution of their shipments. This group accounted for 78 per cent (24,991,000 tons), compared with 73.3 per cent last year and 65.5 per cent in 1925. The table in the center of pages 8 and 9 shows a composite of these data, as furnished by 41 companies.

To determine the final place of consumption of the large tonnages shipped by the steel makers to jobbers, careful allocation has had to be made, paying due regard to the class of material and to the customers of the jobbing industry. Because of the necessity to redistribute such large tonnages, ratio figures taken from the table covering 78 per cent of the output would be misleading. The jobbers furnish very little material to the railroads, but sell many thousands of tons to builders. The automobile plants buy practically all their re-

It Went in Nineteen-Twenty-Seven

quirements direct from the mills, but much of the oil, gas, water and mining tonnage passes through warehouses.

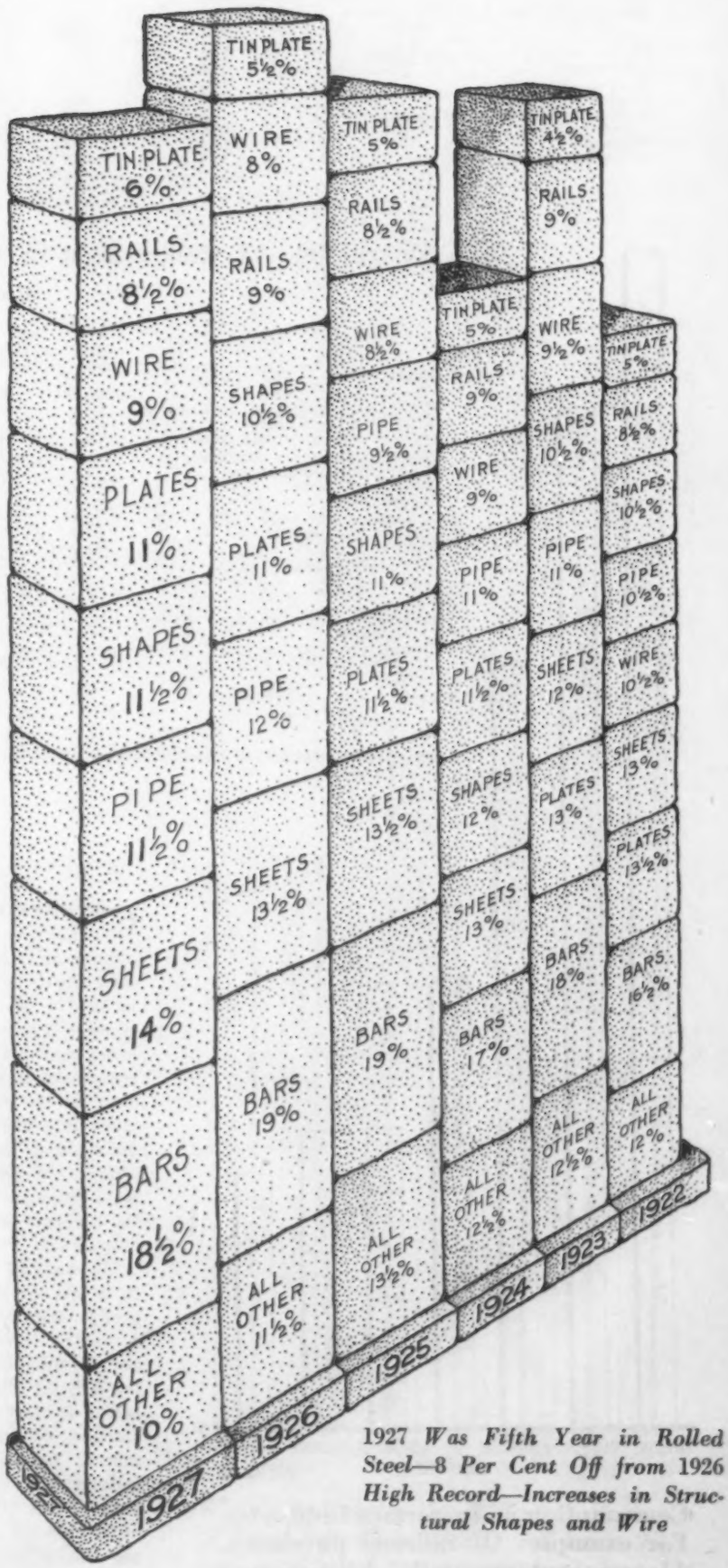
Warehouse purchases constituted 12¼ per cent of the total steel sales reported by the 41 companies which showed complete distribution of their product. More than 3,060,000 tons followed this channel on the way into ultimate service, out of 25,000,000 tons reported. Among the items thus passing through the "middleman," pipe, with more than 1,050,000 tons, represented 34 per cent. More than 500,000 tons of wire, and some 300,000 tons each of sheets, bars and shapes, were sold through the jobbing trade.

By taking more steel than ever before—more, even, than in the record-breaking preceding year—buildings and other construction have taken first place in 1927, relegating the railroads to second position. It is estimated that construction absorbed 7,050,000 tons of steel, while the railroads accounted for but 6,125,000 tons. This estimate of the complete distribution places the automotive consumption above 4,500,000 tons.

Estimates of the total production of the various forms of steel in 1927 are given in a table in this column. Bars, including concrete bars, continue to hold the top position, with over 18 per cent of the total. Sheets were in second place, with pipe, shapes and plates, closely grouped, following. In preparing this table allowance had to be made for the final conversion into finished product of such billets, slabs, sheet bars, wire rod and skelp as were sold in those forms by the principal makers.

Estimated Production in 1927

	Gross Tons	Per Cent
Heavy rails	2,559,000	8.0
Light rails	165,000	0.5
Track accessories	979,000	3.0
Plates	3,514,000	11.0
Structural shapes	3,632,000	11.3
Steel bars	5,895,000	18.4
Hoops, bands, cotton ties	732,000	2.3
Strip steel	931,000	2.9
Tin plate	1,830,000	5.7
Sheets	4,539,000	14.2
Pipes and tubes	3,713,000	11.6
Wire products	2,842,000	8.9
All other products	708,000	2.2
Total	32,039,000	



1927 Was Fifth Year in Rolled Steel—8 Per Cent Off from 1926 High Record—Increases in Structural Shapes and Wire

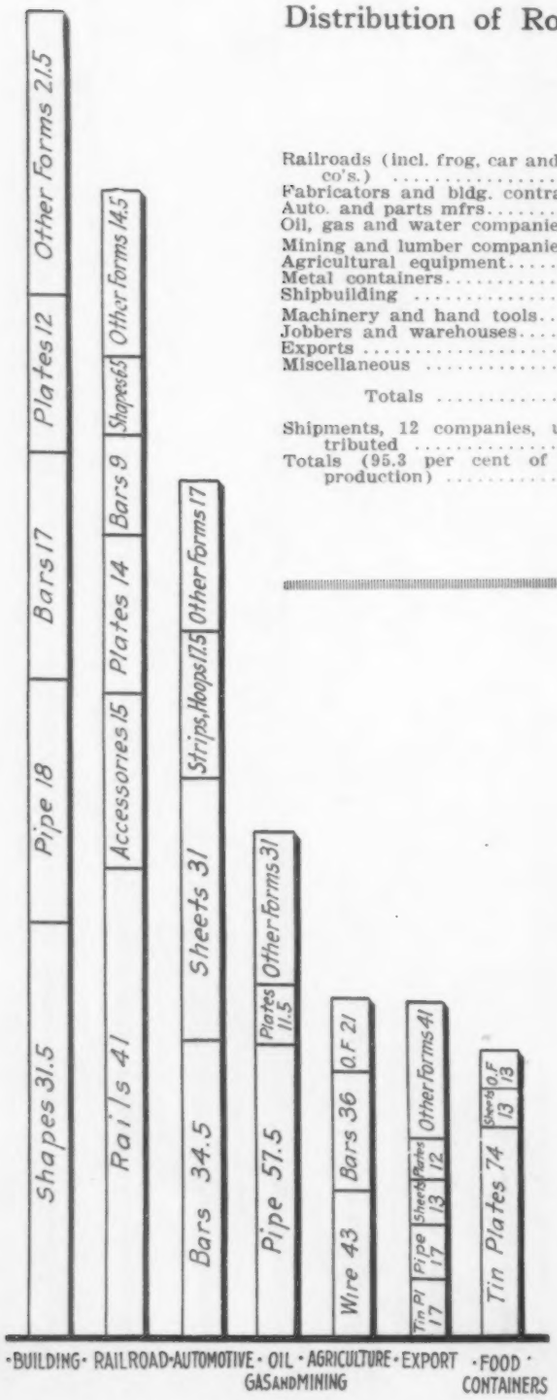
Forms of Steel Different Industries Took in 1927, Showing Percentages Making Up the Total for Each Industry

	Rails	Track Accessories	Plates	Shapes	Bars	Hoops, Bands and Ties	Tin Plate	Sheets	Tubes and Pipe	Wire Products	Strip Steel	All Others
Railroads (incl. cars and locomotives)	40.7	15.1	13.8	6.4	8.9	...	1.1	5.2	1.0	1.6	...	6.2
Buildings, bridges and other construction (not railroad)	...	...	11.9	31.3	17.3	0.9	1.1	8.9	18.2	6.7	1.6	2.1
Automobiles and trucks	...	...	6.1	3.8	34.6	7.6	1.0	30.7	1.1	4.3	9.7	1.1
Oil, gas, water, mining and lumber	5.7	0.5	11.5	3.3	5.5	1.2	2.8	7.3	57.6	3.4	...	1.2
Agriculture	...	...	3.5	2.8	35.7	1.7	1.1	7.8	1.9	43.1	1.4	1.0
Food containers	...	...	3.5	...	0.8	4.7	73.6	13.3	...	2.1	1.1	0.9
Shipbuilding	...	...	48.5	16.9	18.3	1.0	1.2	7.1	1.0	2.4	1.0	2.8
Machinery (electric, textile, machine tools, etc.)	...	...	10.5	10.1	46.4	2.4	1.1	6.3	5.6	12.6	1.0	4.0
Exports	8.9	1.3	11.6	9.5	9.4	1.2	16.9	13.2	16.7	9.3	...	2.0
Miscellaneous	0.5	...	11.8	7.3	18.2	2.1	2.0	25.7	7.7	17.4	5.3	2.0

Distribution of Rolled Steel in 1927, According to Shipments

Amount of Each Form Taken, in Thousands

	Heavy Rails	Light Rails	Track Accessories	Structural Plates	Structural Shapes	Bars	Hoops, Bands and Cotton Ties
Railroads (incl. frog, car and loco. co's.)	2,335.8	2.0	867.5	661.7	265.7	351.4	11.9
Fabricators and bldg. contractors	7.0	0.8	0.5	642.3	1,710.8	759.4	49.2
Auto. and parts mfrs.	....	....	0.1	132.6	29.9	1,145.9	321.8
Oil, gas and water companies	2.5	1.8	0.9	202.8	27.4	47.4	11.3
Mining and lumber companies	21.2	64.4	11.1	33.0	17.1	33.8	3.6
Agricultural equipment	0.6	0.2	0.1	37.6	11.3	196.9	21.2
Metal containers	....	....	....	39.7	1.8	4.0	65.0
Shipbuilding	....	....	....	160.8	41.3	39.7	0.7
Machinery and hand tools	0.6	1.0	0.1	70.0	51.2	361.7	15.4
Jobbers and warehouses	21.2	9.5	13.4	135.5	274.0	340.7	41.1
Exports	151.4	5.6	22.8	181.1	147.9	144.9	18.4
Miscellaneous	18.4	4.6	12.4	383.3	171.6	588.5	70.9
Totals	2,558.7	89.9	928.9	2,680.4	2,750.0	4,014.3	630.5
Shipments, 12 companies, undistributed	....	....	....	327.6	358.2	856.1	3.6
Totals (95.3 per cent of total production)	2,558.7	89.9	928.9	3,008.0	3,108.2	4,870.4	634.1



Consumption of Important Industries. For example: Of railroad purchases, 41 per cent was rails, 14 per cent plates, 9 per cent bars, etc.

Building Steel Surpassed

COMPARED with 1926, there was a considerable change in the proportions of steel taken by several important industries. Agriculture and the "tin can" interests both advanced from 4 per cent of the total in 1926 to about 5 per cent in 1927. Exports gained, through a slight advance in tonnage shipped, out of a lower aggregate of steel produced. A falling off was registered by the oil and mining group and a smaller drop by the automotive industry. The railroads took much less than in 1926, while the building industry, maintaining its enormous stride of the preceding year, absorbed a considerably larger proportion of a smaller total tonnage. Shipbuilding (not shown separately in the diagram on page 6) took 1¼ per cent of the rolled output.

Because of the decline in railroad purchasing and, to a less extent, of the mineral and the automotive groups, the four largest avenues of consumption showed a falling off in their percentage of total steel used. Instead of 67 per cent, as in 1926, they accounted for only 62½ per cent of the aggregate in 1927. This is the smallest such ratio since 1922, for the "big four" absorbed 63½ per cent of the 1925 total, 65 per cent of that of 1924 and 64 per cent in 1923. Construction activity has shown a healthy and well-nigh steady gain. From 15 per cent of all in 1922 it has advanced to 22 per cent in 1927, with the only setback (from 18 per cent in 1924 to 17½ per cent in 1925) representing actually an increased tonnage, though at a rate of gain less than was registered by other lines.

What Percentage of Each Form of Steel Was Distributed in 1927 Among the Industries

	Automotive	Railroads	Agriculture	Buildings and Construction	Shipbuilding	Food and Other Containers	Machinery	Oil, Gas, Water and Mining	Exports	Miscellaneous
Rails	...	86.7	...	0.7	...	...	...	5.3	5.8	1.5
Track accessories	...	93.7	...	...	...	...	...	1.4	2.5	2.4
Plates	8.3	23.8	1.8	23.8	6.1	1.5	3.6	8.7	6.2	16.2
Shapes	5.1	10.7	1.3	60.2	2.1	...	3.3	2.4	4.9	10.0
Bars	28.2	9.2	10.7	20.4	1.4	...	9.4	2.5	3.0	15.2
Sheets	32.4	7.0	3.0	13.6	0.7	4.4	1.6	4.3	5.4	27.6
Tin plate	2.7	3.5	1.0	4.2	...	60.6	0.8	4.1	17.4	5.7
Wire products	7.3	3.5	26.8	16.5	...	1.1	5.3	3.2	6.2	30.1
Pipes and tubes	1.5	1.7	0.9	34.3	...	...	1.8	41.2	8.4	10.2
Hoops, bands, etc	50.0	3.0	4.2	8.9	0.6	9.6	3.9	2.9	2.7	14.2
Strip steel	50.4	1.9	2.7	12.1	...	1.7	1.3	1.3	...	28.6
All other	5.8	46.0	1.9	16.5	1.6	...	6.1	4.5	5.2	12.4

of 41 Companies Producing 78 Per Cent of the Year's Output

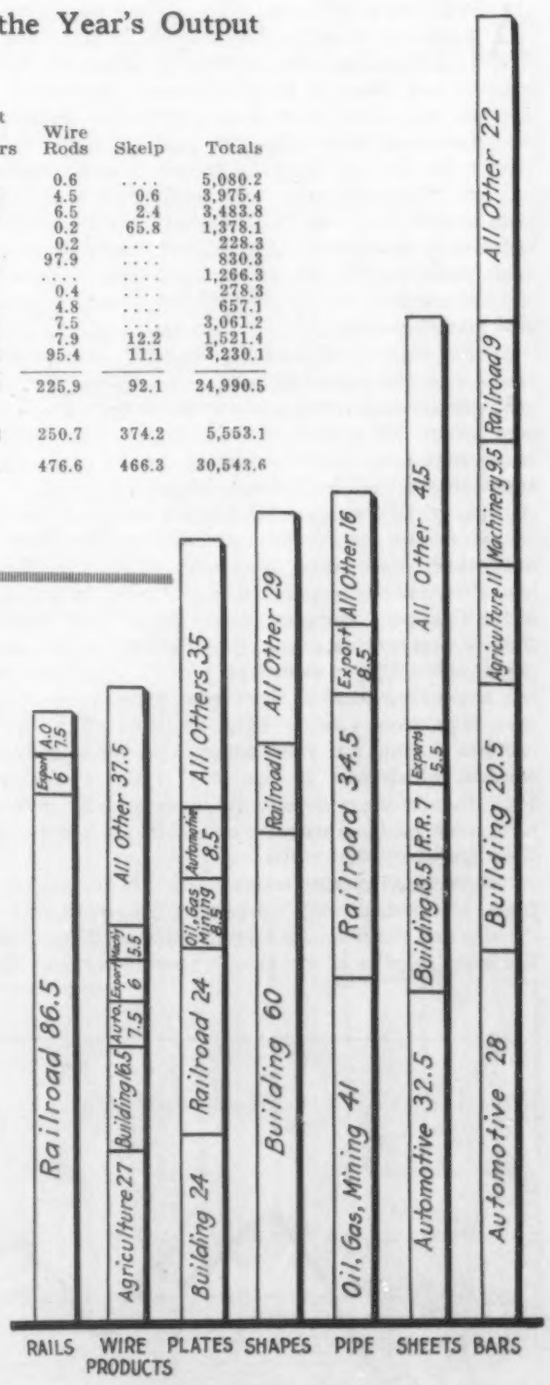
of Gross Tons, by Different Industries

Black Plate for Tinning	All Other Black Plate and Sheets	Tubes and Pipe	Wire Products	Strip Steel	All Other Finished	Billets and Slabs	Sheet and Tin Bars	Wire Rods	Skelp	Totals
7.5	178.3	46.7	44.7	14.2	245.8	45.9	0.5	0.6	....	5,080.2
8.3	360.0	42.0	191.8	90.8	83.0	16.9	7.5	4.5	0.6	3,975.4
19.6	931.3	29.9	117.8	434.0	28.0	178.1	105.9	6.5	2.4	3,483.8
62.3	85.9	812.0	22.0	0.5	14.1	21.2	....	0.2	65.8	1,378.1
0.5	10.6	5.3	19.0	0.5	6.8	1.2	....	0.2	....	228.3
3.5	72.5	3.0	335.8	18.4	7.0	24.1	0.2	97.9	....	830.3
1,000.4	95.6	0.6	23.4	12.3	1.5	3.9	18.1	....	....	1,266.3
0.3	7.2	3.4	6.8	0.5	5.1	12.1	....	0.4	....	278.3
0.3	21.6	28.9	29.8	5.2	29.7	36.8	....	4.8	....	657.1
107.3	297.2	1,052.7	501.6	61.8	32.3	36.1	129.3	7.5	....	3,061.2
285.3	209.5	182.2	119.0	2.2	28.2	2.7	0.1	7.9	12.2	1,521.4
80.7	754.3	170.5	357.1	241.5	60.0	119.5	90.3	95.4	11.1	3,230.1
1,576.0	3,024.0	2,377.2	1,768.8	881.9	541.5	498.5	351.9	225.9	92.1	24,990.5
82.7	335.9	679.5	452.3	....	154.6	751.5	926.2	250.7	374.2	5,553.1
1,658.7	3,359.9	3,056.7	2,221.1	881.9	696.1	1,250.0	1,278.1	476.6	466.3	30,543.6

Railroad Tonnage in 1927

Nearly 41 per cent of the steel tonnage bought by the railroads consisted of rails. Almost one-third of the construction tonnage was in structural shapes. Of the automobile purchases, one-third consisted of bars and nearly an equal quantity of sheets. Much more than half of what the oil and mining interests took was pipe. About 43 per cent of the agricultural tonnage was wire and more than three-fifths of the remainder was bars, mainly used in machinery manufacture. Three-fourths of the food container tonnage consisted of tin plate and half the remainder was sheets. Five-sixths of the tonnage going into shipbuilding was of plates, shapes and bars, the former greatly predominating. These facts, and many others, are brought out by the table and the diagram on page 8.

More than six-sevenths of all the rails went to the railroads, as shown by table and diagram on page 9. They took, also, nearly all the track accessories and one-quarter of the plates. Automobiles accounted for half of the hoops and bands and of the strip steel, one-third of the sheets and more than one-quarter of the steel bars. Agriculture absorbed one-quarter of the wire. Construction required three-fifths of the structural shapes, one-third of the pipe and one-quarter of the plates, and was second only to the automobile in the taking of bars. Food containers took three-fifths of the tin plate, while the oil group was the greatest purchaser of pipe, with more than two-fifths of the total. Exports ran unusually heavy on tin plate, more than one-sixth of the output going abroad.



Which Industries the Different Forms of Steel Served in 1927. Of bars, 28 per cent went to automotive plants, 20½ per cent into building, etc.

Some Improvement in Steel Trade Forecast for 1928

Greater Volume and Enhanced Prices Anticipated by Doctor Haney—General Business Betterment Expected to Help

BY DR. LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

ALTHOUGH 1927 was characterized by a generally declining trend in business, it is none the less true that the total volume for the year was not greatly less than in its predecessor. Industrial production was little more than 2 per cent under 1926. Manufacturing production was nearly 3 per cent less, largely because of the sharp decline in automobile production. Wholesale sales were nearly 4 per cent smaller than in 1926 (see Fig. 3). Railroad freight tonnage for the first 11 months was 2.3 per cent smaller than in the same period of the preceding year. These comparisons are indicative of the strong basic conditions in industry and manufacturing.

Some indexes of business actually showed an increase over the preceding year. Bank debits were 11 per cent greater and retail sales were between 2 and 3 per cent larger. Of course, the very large volume of trade in securities, at record breaking levels, is partly responsible for the rise in bank debits.

But, while the total volume for the year was thus by no means small, the trend during the year was downward. Comparing November, 1927, with November, 1926, industrial production and manufacturing fell about 8 per cent, and employment in factories was more than 6 per cent smaller. Freight traffic actually declined about 25 per cent (see Fig. 1). Imports, which are a good measure of industrial activity, were more than 8 per cent smaller (Fig. 6). One of the largest declines during the year occurred in automobile production, which was 53 per cent lower in November, 1927, than a year earlier. Building activity, however, had recovered by November to within 1 per cent of the same month of 1926.

The foregoing statements apply to production and trade in commodities. Speculative transactions in securities and the financial factors show a different trend. The average price of stocks was some 32 per cent higher last November than in the same month of 1926, and brokers' loans showed almost exactly the same increase. The net demand deposits of the member banks of the Federal Reserve System were 8.7 per cent larger and total loans and discounts were up nearly 7 per cent. Some phases of business, too, showed large gains. Thus bank debits, in spite of some decline toward the end of the year, were 15.8 per cent larger. Farm prices showed a notable gain of 7.9 per cent and *Bradstreet's* index of wholesale commodity prices averaged 5.9 per cent higher.

Thus at the end of the year we find the physical volume of industry and trade at a relatively low level—somewhat below normal—while security prices were very high and bank credit much extended in connection with investments in stocks and bonds and loans secured by them.

Improved Basic Business Conditions

SOME real progress toward improvement in business fundamentals was accomplished during 1927. The following impress me as being the most important points:

1. Considerable recovery occurred in farm prices, which gained on prices of non-agricultural commodities, thus correcting one of the serious maladjustments of the preceding year (see Fig. 2). On the whole, the agricultural situation appears to have turned its post-war corner.

2. The cost of living was reduced in 1927, the National Industrial Conference Board's index falling 2.4 per cent. Residential rentals were reduced materially.

3. Certain basic industries which have been depressed during recent years showed recovery. This is notably true of leather and copper. Cotton manufacturing, too, made gains during the year and wool manufacturing worked into a po-

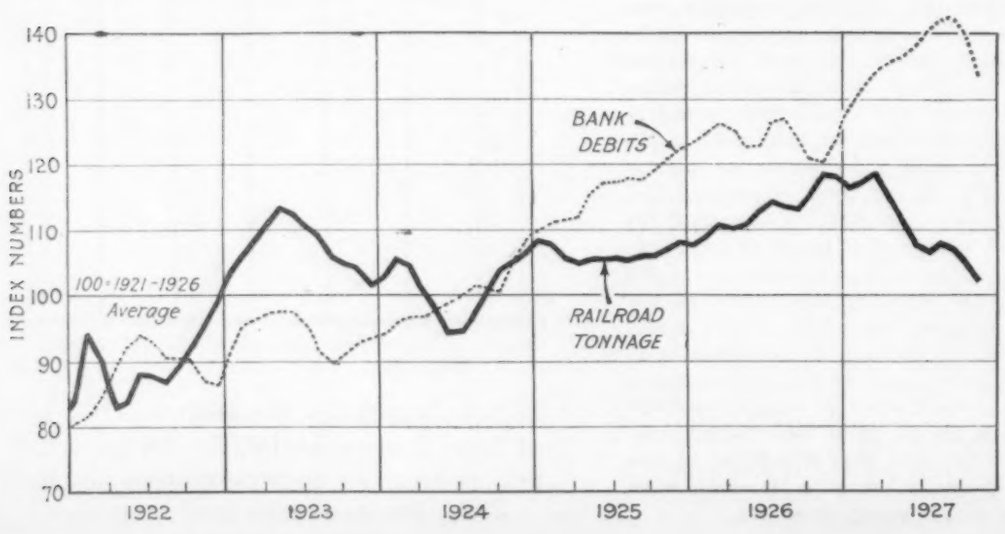


Fig. 1—While Freight Traffic for the First 11 Months Was Only 2.3 Per Cent Lower Than in 1926, November Showed a Decline of 25 Per Cent. Bank debits, on the other hand, made the highest record ever known, averaging 11 per cent above 1926

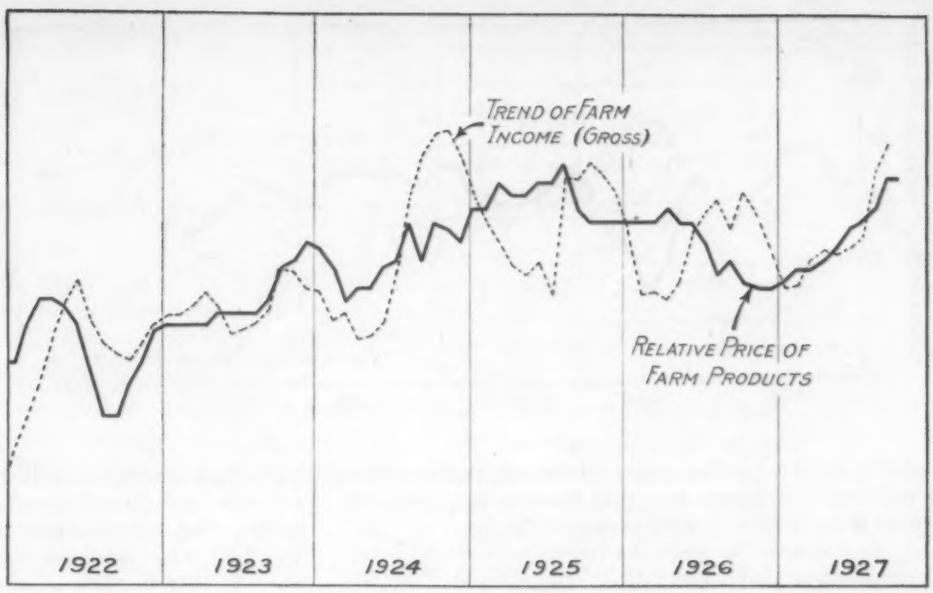


Fig. 2—Farm Purchasing Power May Be Measured by the Relation Between Prices of Farm Products and Prices of What the Farmer Buys. At present the farmer appears to have reached a more comfortable position

sition from which improvement may be expected. Perhaps the outstanding development of this sort, however, was the recovery in the cattle raising industry.

4. Improvement of European financial and industrial conditions (particularly the former) was a notable achievement, the outstanding event being the resumption of a gold basis in Italy. The chief currencies are now stabilized and this will benefit world trade.

5. In connection with the preceding point, there were clear signs of a more effective cooperation among the central banks of the leading countries and the beginning of what it is hoped will be an orderly readjustment of the gold supply of the world. Considerable gold exports occurred toward the end of the year, without indications of causing serious disturbance (see Fig. 6).

6. Within the United States progress toward a readjustment of an over-extended real estate situation appears to have been made without a crisis.

7. Industry has adjusted itself more completely to the so-called hand-to-mouth buying regime, the progress made in operating with smaller inventories being notable.

8. Progress has been made toward more effective cooperation in a number of industries, such as textiles, copper and sugar. The formation of trade organizations designed to use statistical information more effectively and to eliminate unfair competitive practices may, if not abused, mark a real advance.

Further Adjustments Needed

SOME of the maladjustments which were noted a year ago were corrected in 1927. At that time I called attention to over-production of copper, cotton textiles, oil, lard, automobiles, building, pig iron and corn. Probably it may be said that in each of these cases there is now no over-production, although some further correction may be required in cotton textiles and pig iron.

On the other hand, some of the former maladjustments still exist. Stocks of manufactured goods in producers' hands again appear to be too large for comfort, and certainly prevent the conclusion that any shortages exist. (It may be noted, however, that this is, in part at least, a natural consequence of the practice of hand-to-mouth buying.) Bank credit is even more extended than at the beginning of the year, and it is noteworthy that the large increase in bank credit has been due almost entirely to loans and investments connected with the security markets. This, in my opinion, constitutes the chief maladjustment.

Money rates still appear out of adjustment with the commodity price level, although the situation is now reversed in comparison with that which existed a year ago. At that time money rates were relatively high, now they are relatively low, and appear to be so partly

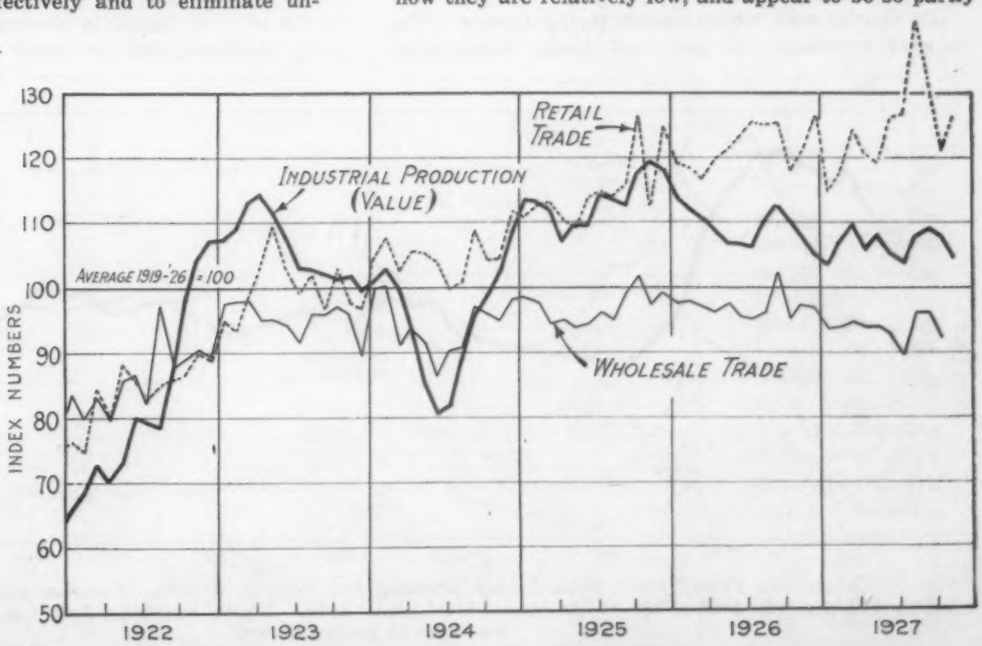


Fig. 3—Wholesale Trade in 1927 Was 4 Per Cent Below 1926, But Retail Sales Are Estimated at 2½ Per Cent Above the Previous Year. Industrial production showed a decline of little more than 2 per cent

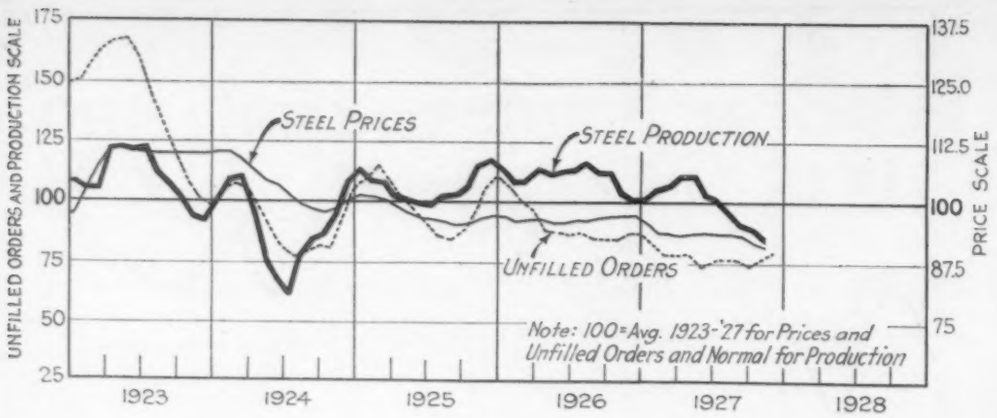


Fig. 4—Finished Steel Was Less Steady in Price in 1927, Dropping From a Virtually Uniform 12-Month Level to 5 Per Cent Lower. Production fell off perhaps 8 per cent. Unfilled orders were lower, but their decline of 18 months has been succeeded by a rising movement

on account of a banking policy which may well be called "artificial." It seems, too, that imports are relatively large when compared with exports (Fig. 6).

Since August, at least, the recession in business has been so clear that no one could fail to see it. The adjusted index of bank debits in that month, as shown in the first chart, was 143 per cent of the average for 1921-1926, but fell to 133 per cent in November. Railroad freight tonnage was 109 per cent and fell to 102 per cent. Here, however, the similarity between the two ceases. Railroad traffic has declined since November, 1926, while bank debits rose steadily and sharply until last August. Freight traffic is the lowest since September, 1924, while bank debits are still higher than at any time in 1926.

This is one of the most pronounced divergences on record. It goes hand in hand with the outstanding characteristic of 1927: The difference in trend between "industry" and "finance"—the one receding, the other expanding. The rise in bank debits reflects the inflation which has affected speculation and retail buying, and the relative over-extension of bank credit in these directions, while the decline in freight traffic reflects the contraction of industrial output.

This condition represents a maladjustment, but it does not seem to be necessarily serious. For one thing, it is partly due to a lower basic level of interest rates, based on the large supply and lower unit productivity of invested capital. The trend of yield on bonds (which fairly represents the basis for capitalizing a reasonably certain income) has been rather steadily downward. This has justified higher prices for equities in the invested capital which yields such income. Thus abundant funds and a lower basis for capitalization have brought higher capital values in spite of the reduced volume of business and earnings.

Of course, such trends cannot go on forever. The outward movement of gold and heavy investments abroad are tending to check the declining trend of interest rates and thus to terminate the advance in capital values. But, just as stocks and bonds went up in 1926 and 1927 while business receded, so business may expand in 1928 in spite of some recession in stocks and bonds. Moreover, before long, any increase in net earnings in business will tend to offset a decline in the basis for capitalizing such earnings.

Business Likely to Gain on Finance

WHAT seems likely, therefore, is a readjustment in the relation between business and finance which will temporarily check both the decline in the interest rate and the rise in security values sufficiently to bring them into line with business earnings. Earnings have fallen so low that a very low basis of capitalization is required to justify present security values. Therefore, what is needed for a time is higher earnings. Temporarily this will probably cause a higher interest rate and lower security values. In a few months, however, higher earnings and a cessation of rising interest rates are likely again to bring higher security values.

It is doubtful if so far-reaching a readjustment can be completed in a year. Nineteen hundred and twenty-eight will probably see the initial phase of a development which will extend over a period of years and be attended by a series of readjustments, in which gold exports, foreign competition, manipulation of money rates by the Federal Reserve Board and corresponding fluctuations in security values will be the outstanding features.

Steel Sales Unusually Stable

AS to the iron and steel industry, the year was one of rather steady and sharp recession. As the fourth chart shows, the decline began in June and the output of steel ingots in November, allowing for seasonal conditions, was the lowest since September, 1924.

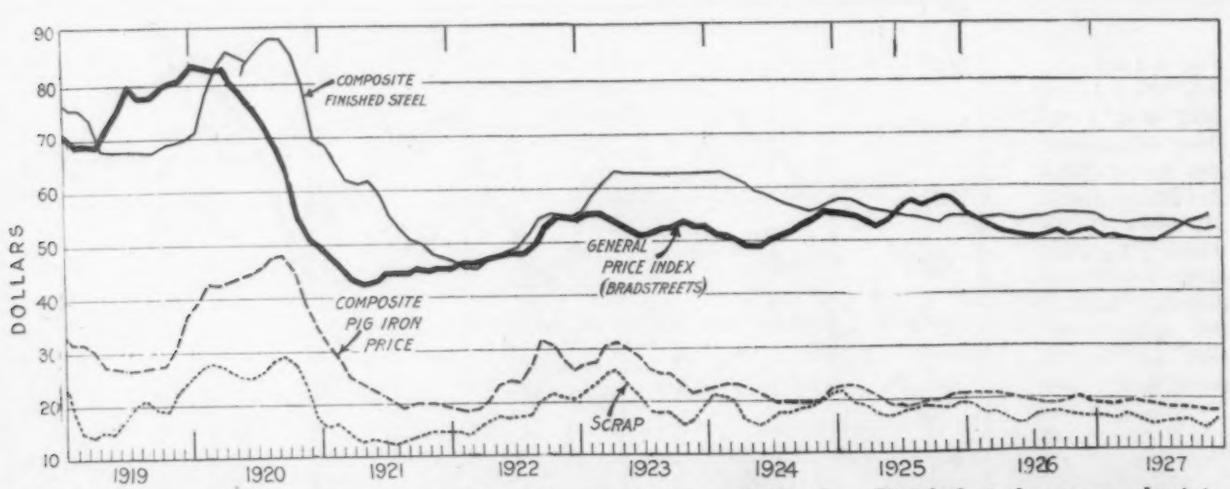


Fig. 5—Commodity Prices Have Been Rising Steadily for Several Months. Finished steel appears about to follow, but pig iron still clings to its lowest level since 1916. Scrap has been below all records since 1921 but now is going upward

Summary of Year's Developments as Outlined by Doctor Haney

1. The year 1927 was one of declining volume of industry and business profits. It lay in the course of a downward swing of a business cycle.

2. At the end of the year the recession in business, notably in steel production, had gone so far that the end of the decline appeared to be near. The absence of credit stringency, recovery in commodity prices, and improved farm purchasing power, all strengthened this conclusion.

3. The year is notable for the divergence between "business" and "financial" indexes, a rather steady expansion in bank credit and security market operations going on while industry receded. Toward the end of the year, the gradual tightening in the position of bank credit (large gold exports and high brokers' loans), and the high level of prices for many stocks and bonds, indicated the probability of higher money rates to come and a readjustment in the security markets.

4. As the new year opens, the outlook is more favorable than that which confronted 1927, for a business recession is in the last stages and is not beginning, as was the case a year ago. A recovery in the volume of industry and in business profits is probable during the first half of the year. The tightening of money markets that is to be expected may be sufficient to check the expansion in business later on; but so far as can now be seen a rising trend, followed by irregular stability, is probable. Sustained construction activity, increased automobile production, and a moderate gain in railroad buying promise increased steel business during the first half year. Stronger markets for iron and steel are probable by February.

It was 15 per cent below normal. The year began and ended with steel production lower than in 1926, and the peak reached in May was considerably under the high point reached in July and August, 1926. Much of the same situation existed in pig iron production, there being a rather sharp recession from April on. The decline in October and November was not so great as in the case of the steel output and, accordingly, the year ends with pig iron production relatively high as judged by steel-making requirements. The ratio of the average daily production of pig iron to the average daily production of steel was abnormally high most of the year. At the end, pig iron production was only 6 per cent under normal.

Unfilled orders of the Steel Corporation reached bottom in May, after a long decline which began in December, 1925. The unfilled orders have been unusually stable at a low level, but the trend was gradually upward toward the close of the year.

Sales of some of the chief items of finished steel during the first 11 months of 1927 amounted to 6,591,000 tons, which compares with 6,619,000 tons in the preceding year, and is practically the same as the volume recorded in the first 11 months of 1925. Steel sales have been unusually stable throughout the year and in November increased to a point considerably above a year ago. This is chiefly due to the recovery in building activity and in agricultural buying of farm machinery and implements.

On the whole, the activity in the steel consuming

(*Concluded on page* 109)

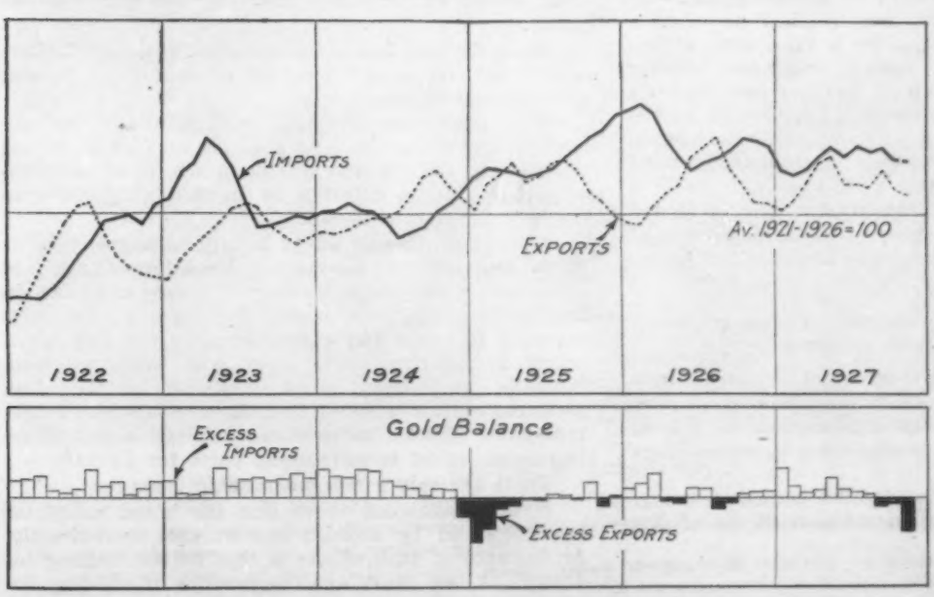


Fig. 6—Imports, Which Are Regarded as a Good Index of Industrial Activity, Were 8 Per Cent Lower in 1927 Than in 1926, But Remained Large Relative to Exports. Gold now is flowing outward in heavy volume

Aircraft of Increasing Importance to Metal Industries

To Aviation's Demands Will Be Added Those Due to Changes Air Travel Will Cause in Modes of Land Travel

BY HORACE C. KNERR*

AIRCRAFT manufacture is giving the world a new branch of the metal-working industry, already of respectable proportions and growing with increasing speed. Last year the Department of Commerce listed more than 90 manufacturers, as many distributers of aircraft, and several hundred firms interested in accessories and associated products. It is probably conservative to say that the activity of the firms listed has doubled in 1927, and that many new firms have entered the industry. Flying fields by hundreds are being established in cities and towns throughout the country. Chicago alone claims a dozen or more.

While much of this growth may be of the mushroom variety, resulting from popular enthusiasm, and therefore short lived, the importance of air transportation is such that a large and steadily growing industry is assured. The transportation of air-mail by private firms under contract to the Government today covers more than 8000 miles of scheduled routes with over 4000 miles lighted for night flying. The Army and Navy are placing large orders with private manufacturers, and the use of airplanes for private flying, both for business and pleasure, has reached astonishing figures. One manufacturer alone is scheduling a production of 100 planes per month for such use; another small town in the Middle West has five busy aircraft factories; there are some sixty odd industries in the Detroit territory engaged in aircraft construction, operation or associated activities. Such instances could be extended to a long list.

Dirigibles, although not at present greatly in the public eye, have clearly demonstrated their commercial application and are certain to take an important industrial place before many years.

Materials Developed for Aircraft Prove of Great Utility to Other Industries

The influence of aircraft on metal industries may be classified as direct, semi-direct, and indirect. Under the first heading comes the construction of planes, dirigibles, engines and accessories—that is, those things which actually fly.

Here the requirements are of the utmost severity. Design, materials and workmanship must be of the highest type. Success depends upon carrying the maximum useful load, and also upon safety, reliability and endurance. The best is ultimately the most economical.

Special grades of steel, alloys of iron and the light metals, have already been developed for the structural parts, and such development must continue. These in turn will be utilized by many branches of the metal-working industry not connected with aircraft. A special analysis of chrome-molybdenum steel of mild carbon content (known as S.A.E. 4130X) has been developed for the construction of fuselages and other structural members of airplanes, largely because of its excellent welding qualities, combined with satisfactory fabricating characteristics and exceptional strength and toughness after welding. The physical properties are subject to still further improvement by normalizing or other simple heat treatment. The original requirements for this metal were only for seamless steel tube, which is now being produced in large quantities. The necessity for joining fittings made of sheet steel to tubular members has recently created a demand for thin sheets of the same analysis, and also for bar stock.

Stainless iron and other corrosion resistant ferrous alloys have an important field of usefulness in seaplane construction.

Duralumin was developed principally for the construction of Zeppelins. As a result of a study of the metallurgy of this remarkable alloy, other wrought aluminum alloys differing in certain characteristics many other industrial fields.

Aluminum foundry alloys of high strength, such as have been placed on the market, and all are growing in applications, not only in aircraft construction but in the Lynite series, were evolved for use in aircraft construction and now find wide and highly valuable application in many industrial uses, with a far reaching influence on foundry practice because of the close technical control required, and the introduction of heat treatment. Aluminum base die castings also find an increasing outlet in instrument parts for aircraft.

These are only a few outstanding examples.

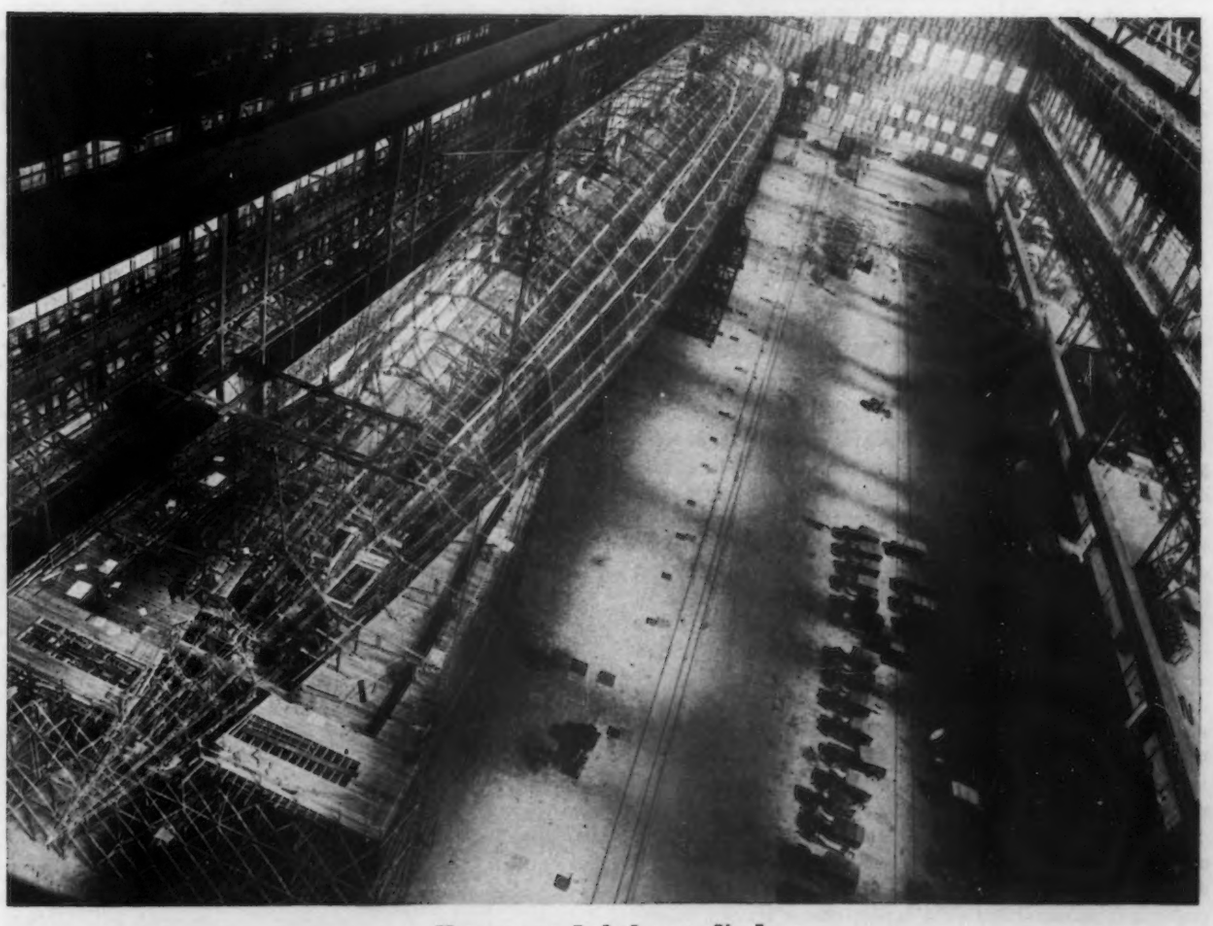
It was mentioned above that the metal industries are influenced by aircraft construction semi-directly. An instance of such effects is that on the welding industry. A few years ago the practice of building fu-

*Consulting Metallurgical Engineer, 538 East Washington Lane, Germantown, Philadelphia.

AT the Left Is a Racing Seaplane Built by the United States Naval Aircraft Factory

WIND Resistance Cut to Minimum in a Racing Car Designed by Frank Lockhart

Stream-Line Forms Utilized in High-Speed Machines



Hangar at Lakehurst, N. J.

BY comparison with the size of touring cars on the floor, an idea can be gained of the great amount of structural steel needed for hangars and of light alloys for dirigible skeletons. This view was taken of the Shenandoah when under construction in 1923.

The head-piece of the article shows a modern mail-carrying plane, built by Pitcairn Aviation, Inc., Philadelphia. Fuselage, struts and landing gear of alloy steel seamless tubes; Wright engine, steel propeller.

selages by the acetylene welding of seamless steel tube was introduced from abroad. This has now become general practice in America and has not only opened a new market for welding equipment, but has developed new technique and established new standards of excellence for welded structures by which industry at large is benefiting. Welding of aluminum and its alloys has also been greatly advanced through the medium of aircraft construction, one of the earliest developments being in the construction of fuel tanks of sheet aluminum.

Methods of corrosion prevention, such as electroplating with zinc and cadmium, and various protective coatings such as paints, varnishes and cellulose derivatives, find an exacting but wide field in aircraft work and the improved materials have been quickly extended to other fields.

The rigorous technical control of materials and processes demanded in aircraft construction has increased the demand for testing equipment and for pyrometers, heat treating furnaces, and other metal treating apparatus.

To all of this, obviously, is added the full line of metal-working tools and shop accessories required in the fabrication of aircraft, together with the factory buildings themselves—all of which has stimulated various metal industries in devious ways.

Aircraft of all kinds must have hangars for shelter, and adequately equipped bases, landing fields and routes for operation. This introduces a new outlet for metal of ordinary commercial grades. Airplane hangars are principally steel sheds. Landing field accessories such as fuel storage, lighting facilities at the field and along thousands of miles of routes, and repair shops call for a diversity of metal products. Hangars and mooring masts for dirigibles also entail notable tonnages of structural steel.

Trans-oceanic service both of planes and dirigibles is another matter of the near future. This, as Colonel Lindbergh and others have pointed out, will probably call for floating landing stages at intervals of a few hundred miles. These must be elaborately equipped both for the care of aircraft and the accommodation of passengers. They will probably take the form of huge floating docks or platforms and, according to plans which have been proposed, will require a metal construction dwarfing the largest ocean liners.

Twenty years ago the automobile enthusiast could hardly forecast the tremendous industry which it involves today. Neither could he predict the good roads movement which now requires not only the services of the best part of the construction industry, but which has widened the sphere and outlook of both the country man and the city dweller. One may now be pardoned for speculating upon the ultimate influence of travel by air upon human habits and thought.

Anyone, after having learned to travel in the air by the most direct route, in straight lines, at speeds from 100 to 200 miles an hour, will no longer be content to progress by the devious and halting transportation now offered by railroad train and automobile. Yet these agencies possess the indisputable advantage, from an engineering standpoint, of connection with terra firma. This is not primarily a matter of safety; properly organized airways have already demonstrated that travel by air may be made practically as safe and reliable as ground transportation. Ground vehicles do not depend upon the expenditure of power or the use of cumbersome and delicate gas containers to support them in a position of usefulness. The automobile is better adapted to everyday use by the average citizen than the airplane and requires less terminal facilities, while the railroad train has the advantage of great carrying capacity in large units. Inherently, ground methods of transportation are capable of greater speeds than aircraft, with less consumption of power per unit of useful load, and with less risk.

To realize these advantages of land travel it will be necessary for future engineers to provide straight and unobstructed lines of travel, and to reduce friction and inertia to a minimum. These things can and doubtless will be done, largely as a result of the methods and materials of construction, the ways of thinking and the commercial demands arising from the habit of travel by air. Highways, instead of following the tortuous contour of the earth, will be constructed on steel ways on level and straight lines, and probably will be inclosed as a protection against weather. Cars and trains will be of light metals or high strength alloy steels to minimize bearing friction and inertia, and construction will have streamline form to minimize air resistance. The consequent enormous demand on the metal industries, both for vehicles and for ways, is obvious.

Trends of Iron and Steel Consumption

More Than 1,000,000 Tons Annual Gain Indicated by a Group of Leading Items

STUDIED over a series of years, returns of production of various items of iron and steel entering into industry show clearly defined tendencies. In most such cases there is an increasing use of the material, in some at a much more rapid rate than the gains in other products. A few of the outstanding cases were covered in two-color diagrams in THE IRON AGE of Jan. 6, 1927. Brought up to date, the leading items indicate an increasing use of iron and steel at a rate exceeding 1,000,000 tons a year.

Many of the items included in the trend studies are not reported in tonnage. Among them are buildings (floor area), foundry equipment, steel furniture and steam pumps (dollars), mechanical stokers (horsepower), and electrical energy (kilowatt-hours). For others, reported by numbers, a tonnage figure may be estimated. This group includes locomotives (figured at 100 tons of iron and steel), freight cars (13 tons), passenger automobiles (1¼ tons), motor trucks, buses, etc. (2½ tons), enameled bathtubs (150 lb.) and steel barrels (65 lb.)

Based on the above, the annual changes in tonnage and other demands shown by the several trend lines may be estimated as follows:

	Increase Gross Tons	Decrease Gross Tons
Passenger automobiles	320,000	.....
Motor trucks	90,000	.....
Concrete bars	31,000	.....
Fabricated structural steel	82,000	.....
Wire and wire products	26,000	.....
Locomotives	.....	12,500
Freight cars	.....	11,000
Commercial steel castings:		
Railroad	2,200	.....
Miscellaneous	9,300	.....
Steel sheets	343,000	.....
Structural shapes	75,000	.....
Enameled bathtubs	12,500	.....
Steel barrels	24,000	.....
Gray iron (Ohio foundries)	23,000	.....
Iron and steel	1,038,000	23,500
Copper	11,000	.....
Tin	2,200	.....
Zinc	6,800	.....
Non-ferrous metals	20,000	.....
By-product coke	2,312,000	.....
Bituminous coal	4,823,000	.....
	Square Feet	Square Feet
Building contracts	5,424,000	.....
Industrial buildings	.....	7,070,000
	Dollars	
Foundry equipment	636,000	.....
Steam pumps	172,000	.....
Steel furniture	2,105,000	.....
		Horsepower
Mechanical stokers	.....	11,000
	Thousand Kwhr.	
Electrical energy	4,725,000	.....

Aircraft Manufacturing Increases

Civil Flying Activities Grow Tremendously in Year and Output of Planes and Engines Will Greatly Exceed 1926 Total of $24,000,000—Airways 8441 Miles

BY CLARENCE M. YOUNG*

THE new year in aviation is one of bright prospect for the United States and, indeed, for the whole world. This is especially true in regard to commercial aviation, in which vast strides have been made during the year just ended.

Through the use of the air mail entire business days have been saved in communication between the east and west coasts and also between sections connected by feeder lines joining the transcontinental route. Banking houses and jewelry stores and other organizations particularly interested in saving time in transport of valuable goods have come to rely on this new and rapid service. The cost of operation has been reduced through the building up of a great airway system in the United States so that the rate to the user is extremely reasonable.

Airplane Industry Cannot Meet Demand

So extensive have been the developments that the aircraft manufacturing industry cannot keep up with the demand for its products. Exact figures for 1927 are not yet available, but in 1926 there were 1186 planes produced. Approximate figures for 1927 indicate that at least 1525 planes have been built and that there are 1239 unfilled orders. Census statistics for 1926 show a total value of $24,161,752 for production of aircraft and engines. This was an increase of 60.3 per cent over 1925. The figures for 1927 will be much greater, and it is impossible to estimate how far those of 1928 will exceed the record of the past year.

Classification of Aircraft Manufacturers

The manufacture of aircraft and engines is only a part of this new and growing industry. The Aeronautical Trade Directory issued by the Department of Commerce indicates the ramifications of this new business. Among other details are listed the number of manufacturers of various products:

Airplanes	90	Aeronautical instruments	19
Seaplanes and flying boats	10	Lighter-than-air ships	5
Aerial cameras	2	Lighting equipment	23
Chemicals and similar products	9	Metals for aircraft	10
Aeronautical clothing	12	Ignition equipment	20
Aircraft engines	43	Mooring masts	6
Engine rebuilding	8	Parachutes	1
Fabric	10	Paints and varnishes	3
Aircraft furniture	1	Airplane radiators	9
Electric generators for beacon lights	5	Airplane sirens	3
Glue and cement	13	Spare parts	1
Goggles	4	Tie rods and fittings	57
Canvas hangars	3	Skeleton beacon towers	4
Metal hangars	25	Aircraft wheels	10
		Wind indicators	6
			3

The directory also shows 81 airplane distributers, 30 airplane dealers, and eight airport designers and constructors.

The skeleton beacon towers mentioned in the preceding list are used on airports and along the civil airways. These towers are 50 ft. high and are constructed of light galvanized structural steel. Powerful beacons are mounted on platforms at the tops of these towers to indicate the airways and assist pilots in locating airports. These beacons are usually located about 10 miles apart along the airways. A beacon is also installed at each intermediate landing field, such as are maintained by the Department of Commerce at intervals of about 30 miles.

United States Airways Total 8441 Miles

On July 1, 1927, the Post Office Department transferred its transcontinental airway, crossing the continent from New York to San Francisco, to the Department of Commerce. This included all of the equipment at the 124 intermediate fields between the two coasts. With certain contract air mail routes there were at that time 4121 miles of lighted airways. Over 1500 miles were added to this figure during the latter part of 1927. The Department of Commerce is planning lighting on still more routes and is establishing unlighted intermediate fields to facilitate operation on daytime routes.

The total length of airways in the United States is 8441 miles. The daily mileage flown over these airways is 18,926. In the calendar year 1927 there was an increase of about 23 per cent in total mileage flown over the civil airways of the United States, compared with the preceding year.

It is expected that by spring there will be over 12,000 miles of airways in operation, and that over 26,000 miles will be flown each day over these lines.

The planes operating on these routes are in most cases modern types, some of which are inclosed cabin planes capable of carrying several passengers in addition to mail, express, and freight.

The American Railway Express Co. has carried on express service since Sept. 1, in conjunction with the Colonial Air Transport, National Air Transport, Western Air Express, and the Boeing Air Transport companies, enabling manufacturers to send packages at a lower rate than could formerly be done by air mail.

Country Now Has 1016 Landing Fields

Airport development throughout the entire United States has been remarkable. This is particularly important, as no method of transportation can expand without sufficient terminal facilities and service stations. There are now 1016 municipal, commercial, Department of Commerce, Army and Navy, and marked auxiliary landing fields. There are thousands of emergency fields throughout the country on which landings have been made but which are not always maintained for such services. At least 328 cities have indicated intentions of constructing municipal airports, or commercial airports which will be available for municipal operations.

Statistics of scheduled air transportation show only a small part of the activity in the industry today. Miscellaneous flying, including "taxi" service, aerial photography, crop dusting, surveying, mapping, and many other services form the greater amount of flying in America, although it is difficult to estimate this because of the lack of reports from these many operators.

Considering all of this gratifying development in air commerce and the great opportunities now open in all phases of the industry, there is no reason why civil aviation in the United States should not soon take its rightful place as a leader in this science which was begun by our own pioneers.

*Director of Aeronautics, Department of Commerce.

Power Farming Demands New Materials

Metallurgical Development Closely Following Automobile—Greater Stresses Met With Better Steels, Carefully Heat Treated

BY HYMAN BORNSTEIN*

THE principal development in farming during the past few years has been the rapid growth of the use of tractors, and with that has come the development of implements to be used for power farming. The extensive use of the tractor has necessitated the development of entirely new implements as well as modifications in old ones. These developments mean changes in design as well as in materials and treatment.

First, there has been a modification in the tractor itself. The tractor of a few years ago was more in line, in reference to design and materials, with the farm implements of that time. The tractor was heavy and low-grade materials were used. During the past few years, tractor development has closely followed that of the automobile, so that power has been increased while weight has been decreased. The design has been notably improved and along with that has come the use of higher grade materials.

Evolution of the Tractor Plow

One of the first implements to be designed for use with the tractor was the tractor plow. Two elements were required: A minimum of weight, consistent with performance, and a maximum of strength. This meant the employment of better materials. One of the first points of weakness was the plow frame. It was found necessary to subject these parts to heat treatment to obtain the maximum in physical properties and to specify a definite range of analysis for materials. Another one of the developments with the tractor plow was the substitution of rivets for bolts. This was to maintain a more rigid frame to meet the greater stresses encountered in power farming.

Up to about ten years ago, the steels bought for the production of farm implements were purchased on a very loose specification. The big bulk of material used was Bessemer steel and re-rolled old rail steel. The Bessemer steel was divided into two grades, soft Bessemer and hard Bessemer. A comparatively small amount of open-hearth steel was used and this was also divided into two grades, soft open-hearth and hard open-hearth. The designer of farm implements at that time concerned himself very little with the details of materials specifications. Quite frequently he might specify soft Bessemer or old rail for the material on a particular job, although the physical properties of these two materials would be considerably different.

Heat Treatment and Closer Specifications

With the development of power farming, greater stresses were set up and it was desirable to keep the weights of the implements down. As a result, detailed specifications have been worked out for the materials used in the various parts of farm implements. Along with this has come a very rapid increase in heat treatment of steel parts. With the increased use of heat treatment has come the substitution of open-hearth steel for Bessemer steel. At the present time, comparatively little Bessemer steel is being used in the farm implement industry and practically no Bessemer steel is used where heat treatment is specified.

The heat treatment carried on by farm implement manufacturers of today is considerably different from the heat treatment of ten years ago. The crude furnaces of that period have been replaced with furnaces which compare favorably with the equipment now used by the automobile industry. Automatic temperature control is the usual thing now on the heat treatment of farm implement parts, where it was practically unknown a few years ago. The pyrometer is being used to determine temperatures accurately, instead of the guess work as to temperature formerly used. Inspection methods have been improved. Hardness limits have been placed on various parts subject to heat treatment and a careful check is made to see that these specifications are maintained.

A more careful check is made of incoming materials. The testing laboratory has become an integral part of production. As a general rule, the materials are subjected to chemical analysis and then are released to the shop for production. Physical tests have been of considerable value in the improvement of design.

Why a Different Plowshare Was Needed

The development of a particular plowshare will illustrate the change brought out by power farming. This particular plowshare had been used for a number of years with considerable success, and the results in the field were satisfactory. Gradually complaints started to come in from the field in reference to breakage of this share. These complaints increased from time to time. The matter became serious enough to merit a close investigation. It was found that the use of the tractor has set up heavier stresses than this share was originally designed for and it was necessary to modify this plowshare in order to make it stand up under present conditions. In this case, it was necessary to change the design and also make a change in the material in order to secure the desired results.

For many years, the disks used for disk harrows and disk plows were made from a high-carbon steel not heat treated. Again the use of the tractor forced the development of a better disk. At the present time, practically all of these disks are being heat treated and the farmer is obtaining a much better product with

*Director testing and research laboratories, Deere & Co., Moline, Ill.

One of the Modern Power Farming Implements Which Are Augmenting Capacity for Tilling the Soil

practically no increase in cost. In some cases, alloy steels have been used to obtain the desired physical properties. Riveting and welding are being used largely instead of bolts. Material improvement in physical properties of bolts has come about through use of higher carbon steels and through heat treatment.

By applying the lessons learned in automobile manufacture, the farm implement manufacturer is working to closer limits. The lubrication methods are considerably superior. Grease gun lubrication has become quite common. In the manufacture of disk plows, high-grade anti-friction bearings have replaced the old cast iron bearings. In the manufacture of wheels, electric welding has replaced hammer welding for tires.

More Use for High-Test Cast Iron

There has been considerable improvement in the quality of cast iron used for farm implements. Only a few years ago, high-test cast iron or "semi-steel" was little known in the farm implement industry. Today steel is used to a very considerable extent in the cupola charge and there has been a considerable increase in the strength of the iron. There is a strong tendency at present to replace castings wherever possible with forgings and pressed steel parts.

During the past ten years there has been considerable improvement in farm implements. The lessons learned in automobile manufacture have been and are being applied in the manufacture of agricultural implements. Mass production, progressive assembly, and closer limits have been borrowed from the automobile industry. More rigid specifications on materials are being used and higher grade materials are being employed. Furthermore, the use of heat treatment has increased and the quality of the heat treatment has been improved.

Business Conditions Stable—Hoover

Improvement in Farm Prices, Increased Foreign Trade, Recovery from Partial Unemployment and Sustained Volume of Building Are Reassuring Factors

"A STATEMENT of prospects requires a short catalog of the economic forces which dominate the business situation at our entry into the new year," said Herbert Hoover, Secretary of Commerce, in reviewing the outlook for 1928.

"There is an ample supply of credits at low rates; the somewhat larger stock of goods which were accumulated during the summer are being reduced; there is no consequential speculation in commodities; the crops have been abundant; wages are at a high level; we are recovering from some partial unemployment, especially in the automobile industry. There is peace in most sections of the labor world except bituminous coal; there is more peace in the international world than at any time since the war; the foreign world is recovering its economic strength and buying power, and therefore our foreign trade is steadily increasing. The phenomena usually accredited as premonitory of a slump are therefore absent.

"During the past year there have been important shifts in our own economic world which have an important bearing upon the future. While the average wholesale price of all commodities at about 50 per cent above pre-war is today the same as a year ago, yet if we divide them into agricultural and non-agricultural goods, it will be found that the average price of non-agricultural products has fallen in the 12 months from about 60 per cent above pre-war to 51 per cent pre-war; while the average of agricultural products at central markets has risen from about 35 per cent above pre-war to about 53 per cent above pre-war. However, prices on the farm show only a rise of about 30 to 39 per cent above pre-war.

"Manufacture and distribution have by savings and diminished profits accommodated themselves to this situation of decreasing prices without reduction in the average level of wages and therefore in the national buying power. But the great extent to which industry has accommodated itself to lower prices by decreased costs makes for a sounder condition for the ensuing year. Despite decreasing prices, production and consumption of manufactured commodities have been maintained upon a high level, as shown by car loadings of this class of goods, which have been about equal to those of last year.

"As to particular industries, agriculture, textiles, bituminous coal and some metals still lag behind the others. The contracts let for future execution in the construction industries are at as high a level as at this time a year ago.

"Taken in a broad sense, we enter the new year with the forces of stability dominant in the business world."

What Outlook for the Average Manufacturer?

Small and Medium-Sized Plants Hold Their Ground in Various Fields Through Efficient Management and Market Study

"THE eye of the owner maketh a fat horse." This homely epigram of the late Andrew Carnegie, epitomizing the greatest advantage of owner-management of an enterprise, reflected his skepticism concerning the economic soundness of large industrial corporations, where management is hired and ownership is widely dispersed and bereft of contact with the rank and file of employees.

Since his time, however, the trend toward larger corporate units, particularly in fields adapted to mass production, has continued. Yet it is frequently overlooked that in the fabrication of articles from iron and steel, small and medium-sized plants still greatly outnumber mass production shops. In fact, the smaller manufacturers make up the warp and woof of industrial life, and it is by no means established that as a class they face extinction or absorption into large units.

Smaller manufacturers retain an advantage over their larger competitors in the "intangibles," one of the most important of which has been cited. Their opportunities for efficiency in certain fields are as great, if not greater than those of large corporate organizations. The main motif of mass production, the reduction of costs through increases in output, is also its greatest weakness, since it is dependent upon a proportionate expansion of consumption.

A more secure policy, and one that is being followed by many manufacturers, is to place the emphasis on cost reduction per unit of labor and capital without striving for material increases in total output. An analysis touching on this and other factors affecting the economic position of the smaller manufacturer, and practical suggestions as to how he can meet current problems are outlined in the following symposium of articles.

The Future of the Smaller Manufacturer

BY VIRGIL JORDAN

DURING most of the past 25 years Americans have been suffering from a chronic megalomania, especially in economic matters. They have become more and more enamored of bigness and impressed by mere size in everything, from moving picture houses and football stadiums to manufacturing enterprises, and they have been happiest when dealing with figures from which several sets of zeros have, as a matter of course, been omitted. Both our glorification of large-scale business and industry, and the attacks upon them by over-anxious liberals and radicals, have bred in the public mind generally the idea that enterprises of enormous size are characteristic of American industry and trade and also that the rapid trend toward constantly larger enterprises is natural and inevitable and likely to go on without limit.

This axiomatic idea, however, is questionable on several grounds. In the first place, American industrial development is, practically speaking, a matter of only 50 years, and such a period is too short to warrant any conclusions as to what is characteristic, typical or inevitable for the future. Secondly, there is good reason to regard the rapid increase in size of industrial establishments and business enterprises as the product of the early period of our economic development, accompanying the building up of a new country, the rapid and extensive expansion of transportation and the first stages of application of new forms of power and machinery to production and distribution. Third, our population and therefore the market for products is becoming more and more evenly diffused geographically, while the use of electric power and internal combustion engines in manufacturing industry and transportation, as well as changes in agricultural conditions, have made it less necessary or desirable for industrial centers and centers of distribution to be crowded close to sources of materials and power or to rail transportation centers. Finally, large-scale mass production is not equally suited to all branches of industry, any more than large-scale extensive agriculture is suited to all branches of farming; and in many branches of industry it is becoming a question whether, from the point of view of economic efficiency as contrasted with engineering or technical efficiency, the limit of the scale of production has not been closely approached. One important reason for the latter question lies in the new importance which attaches to the problem of distribution in modern industry.

Mass Production Has Limitations

In the period of American industrial development which has passed, attention has been centered almost wholly upon engineering and technical efficiency in production. To most engineers and managers in industry this has meant merely an effort to increase the volume of production per plant in a given period of time, through heavy investment in expensive special purpose machinery designed to turn out large quantities of standardized products. Effort has been directed essentially toward increasing the speed of production, and the heavier the investment in machines adapted to this purpose the more necessary it

has been to reduce the time consumed in production in order to keep down overhead costs. All of this was based on the illusion that mere reduction in time or increase in speed of production automatically implied a reduction in real costs. But the result has been only that overhead costs of management and organization in proportion to other costs have grown more rapidly than ever.

In cases where this process has been carried to the extreme, as in the Ford organization, changing consumer tastes and market conditions have forced cessation of operations for long periods of time and tremendous scrapping of equipment at enormous cost, because of the rigid limitations and inflexibility of this form of productive organization. What has been saved in time required for actual production has been lost in the time required for adjustment to new conditions, and above all in the time required for distribution of the product. Though in a narrow sense labor costs have been lower in such industries, diminishing profit margins indicate that total real costs have not been proportionately reduced, so that salvation has depended not really upon efficiency of production but upon volume of sales and absorbing power of the market. What has been achieved is efficiency in the engineering sense, but not economic or business efficiency.

This circumstance has brought our large-scale industries face to face with the fact that consumption or absorption of the product by the market cannot be speeded up indefinitely as production can. Some industries have unconsciously met this situation by producing goods which wear out or are used up more rapidly; but in the race between production and consumption, where it is based solely upon the time element, it is becoming increasingly evident that production is bound to be the winner and that in this case the winner is the loser. This is true in spite of the fact that the large-scale enterprises have been able to achieve great economies in distribution and marketing on the side both of buying and selling.

Inherent Advantages of Smaller Manufacturers

When the fundamental distinction between efficiency in terms of time and efficiency in terms of real costs is fully realized, I feel that it will be more and more apparent that the smaller manufacturing enterprise has certain inherent advantages which will make its place increasingly important in our industrial life. From the point of view solely of production the smaller enterprise has as good, if not better, possibilities for reduction of real costs in terms of labor, capital and management than the very large establishment. The labor supply can be in many instances more effectively recruited, the working process more closely and directly controlled, and the problems of labor administration and industrial relations are likely to entail less difficulty and overhead cost than in the larger enterprise. It is possible also for a smaller establishment to adjust its product, as well as its manufacturing processes, more flexibly to changes in market conditions. This is the most important consideration in the present industrial situation, where consumer tastes and habits are constantly shifting, and where the market for specialties is on the whole more favorable than for thoroughly standardized mass products. Moreover, with the new transportation facilities and the wider availability of electric power, the smaller establishment has a larger freedom of location in relation to its market, its source of material and labor than the larger plant. It should be emphasized also that the smaller establishment has a greater flexibility of adjustment to changing market conditions in that the overhead costs of shut-downs or part-time operation are relatively less burdensome than in the larger plant. This is simply another way of saying that the smaller establishment has the advantage of not being under such great pressure to reduce its time costs, and can concentrate upon reduction of its real labor, capital and management costs, in which it can achieve as good results as the larger plant.

THE author has been chief economist of the National Industrial Conference Board, New York, for the past seven years. He is a frequent contributor of articles on current economic questions to magazines and newspapers here and abroad, and is the author of books on the agricultural problem in the United States, the inter-ally debts and other subjects

How Smaller Plant Can Overcome Its Handicaps

The chief handicaps under which the smaller establishment has been laboring in the recent past have been those of securing its supplies of materials on favorable terms, and of advertising and selling its products in competition with the larger enterprises with more money to spend on national advertising and distribution agencies. It has been more difficult also in past years for the smaller establishment to secure on favorable terms a constant source of new capital necessary to alter its production programs and install improved methods, or to engage in scientific research. These disadvantages, however, have not been so serious as they have appeared to be and are growing less important as time goes on. For one thing, there has been developed since the war in this country such a vast and fluid capital market, under the pressure of enormous savings seeking investment, that it is becoming easier for the smaller enterprise whose financial position will stand close scrutiny, to secure all the capital it needs. The advantages of scientific research are becoming available for the smaller plant through trade organization cooperation, university cooperation, and the scientific foundations. Moreover, through the increasing spread and effectiveness of trade organization the smaller manufacturer is becoming increasingly able to secure the advantages of large-scale industries in buying and selling by means of syndicate purchasing and through industrial or trade association advertising. It is probable that some of the legal barriers now in the way of more thorough-going cooperation of small independent manufacturers in the fields of purchasing and distribution may be overcome within a short period of years. It is clear that this is necessary and the necessity is being more generally recognized. In this way there may grow up in the field of manufacture in a short time forms of cooperative organization under which the advantages of small manufacturing units in production are maintained, while those of large-scale production in buying and selling are achieved in somewhat the same way as has developed in agriculture.

Trend Toward Larger Plants Has Slowed Up

That these factors are playing a part in the development of American industry is suggested in the fact that the trend toward large-scale enterprise and industrial consolidations which went forward so rapidly up to the beginning of this century has tended to slow up markedly, even though it still continues. For instance, although the average number of wage earn-

ers per plant in steel works and rolling mills increased about 170 per cent between 1879 and 1914, the increase has been less than 35 per cent since 1914. In agricultural implement manufacturing the average number of wage earners per plant in 1914 was four times as great as in 1879, but from 1914 to 1921 it increased only 17 per cent. More striking still is the fact that the physical output per plant among iron and steel works and rolling mills in 1914 was approximately nine times as great as in 1879, but from 1914 to 1925 had increased only about 60 per cent. The fact that these plants are in many cases parts of larger organizations or have been consolidated into large corporate units to secure the advantages of a ready market for their securities or of large scale buying and selling, does not in any way reflect upon the productive efficiency of the smaller plant. Particularly interesting as bearing on the question of relative efficiency of the large and the small plant is the fact, shown by studies of the National Industrial Conference Board, that during the period 1919-23 the medium-sized manufacturing plants, especially those with an annual output ranging from $20,000 to $500,000, have gained in efficiency of utilization of labor over the group producing over $1,000,000 worth yearly, even though the per capita output in the latter is larger. In 1919, in the larger plants, the production per worker was $1,590 for every $1,000 produced per worker in all other plants, but by 1923 this had fallen to $1,481, a decline of about 9 per cent. In the plants in the $20,000 to $500,000 group, however, the relative production per worker increased about 6.3 per cent.

Thus the smaller manufacturing establishment would appear not only to have an increasingly important rôle in the future, but is at the present time of far greater importance in our manufacturing life than we usually realize. In 1925 about 93 per cent of all manufacturing establishments had a value of product at 1914 prices of less than $500,000 a year, and these establishments employed over 38 per cent of the total wage earners in manufacturing and produced over 28 per cent of the total value of manufacturing production.

Average Manufacturer Must Be Better Business Man in 1928

BY HENRY BRUERE

THE average American manufacturer, and that means the smaller manufacturer, will not have a rosy time in 1928. He has not had a particularly rosy time in 1927. There will be more of the same kind of competition for new business and for retaining old business that manufacturers have faced during the year just closed. There will be the same type of narrowed profit margins. But there will be an advantageous difference. In 1928, the producer who profits by experience will not expect a repetition of the exceptional business of 1926, and he will be prepared for the more exacting requirements of a period of business retrenchment. Every business man who is looking for profit in 1928 will have to be a better business man in the new year than he was in the year closed. I am basing this statement on the general prediction made by business analysts of a good but not glowing, business year in 1928.

There are various ways in which the average business man can suffer: By loss of his market through evaporation, that is, a ceasing of demand, such as certain automotive parts suppliers have faced recently; by running into the red due to internal inefficiencies; by loss of trade and profits as a result of the inroads of the big competitor.

There can be no satisfactory generalizations regarding all types of business beyond these minimum observations. There will also be no deadly uniformity in the conditions smaller businesses will confront. The smaller plants, that is the plants producing less than $100,000 in value of manufactured product in a year, represent 80 per cent of the manufacturing institutions in the country. They are located everywhere. You can't generalize about them except to say that they will face generally a slower business pace and, where they are in competition with them, greater eagerness for business on the part of national distributers. You can't generalize, that is to say, unless you are willing to make certain assumptions.

A Lesson from New England

For the purpose of this little friendly heart-to-heart talk, I am going to make an assumption. I am going to assume that all the average businesses in America are collectively on Jan. 1, 1928, in the same situation that collectively all business in New England was supposed to be in a year or two ago—that is to say, rather dubious about the future and not at all elated over current profits. The purpose of this assumption is to enable me to use some rather illuminating illustrative material recently gathered in New England in a study of progressive business policies in vogue there. The study was made by the Metropolitan Life Insurance Co. for the New England Council, a representative body of New England business men appointed by the Governors of the five States to promote the economic welfare of that section. The Metropolitan Life Insurance Co. sent experts around to look for good examples of energetic and enlightened business methods, which, if generally employed, would probably remove the gloom from the brow of the average Yankee manufacturer, and what is true of the size of the average manufacturer in the United States is measurably true of the size of the New England factory operations.

How Market Study Helped a Cutlery Plant

The outstanding fact of importance was the recognition by progressive business men that this is the age of the buyer's market. Time was when customers stood in line for opportunities to buy. The manufacturer surviving under today's competition studies his existing customers' wants and goes out to find new customers with a definite idea of his needs in mind, based on analyses of the uses to which the product to be sold will eventually be put. A case in point is the revival of a failing cutlery business built upon the basis of the black-handled knife formerly found on every farmer's and mechanic's dinner table. One customer formerly took one-third of the output. That customer stopped buying. How was the void to be filled? Household furnishing departments were studied. Kitchen cabinets and tea rooms were looked into. Knives were discovered in use that added gayety to the table and the kitchen because of colored handles. Black handles were changed to blue and business was recovered.

Simplification Aids a Shoe Manufacturer

Inventory burdens have been reduced by simplification. The classical example of the Regal shoe is again cited. That company used to make 2500 varieties of shoes to retail at $10. Records were kept of the foot measurements of customers. Many varieties were found to be made for non-existent feet. Poor business. Varieties were cut down from 2500 to 100. The price was cut from $10 to $6, with no reduction in quality. That has been a good move for the Regal Shoe Co.

Another plant, a woolen mill, reduced the 160 yarns, varying in color, material or counts, to 30, and production has been doubled.

Costs Reduced by Replacing Antiquated Machinery

Liberal machinery replacement policies are in force in the up-and-coming New England industries.

One company is reported to have decided after research that high costs were due to three causes:

1. The use of antiquated machinery and methods.
2. Unnecessary handling charges through widely separated departments.
3. Burdensome carrying charges on idle floor space and idle equipment.

The entire plant was rearranged; total floor space occupied was reduced one-fifth; departments were consolidated or moved to more advantageous locations; old machines were replaced with new machinery of latest design, most of them motor devices; special machines were designed for more economical dyeing of small lots.

A paper manufacturer studied consumers' habits and the retailer's viewpoint. Inquiry was made on the extent to which consumers buy paper by name or brand and the principal brands called for, one purpose being to test the effects of past advertising on stimulating demand for the product of the manufacturer making the survey.

How a Ball Bearing Maker Found a Broader Market

A manufacturer of ball bearings wished to broaden his market beyond the automotive industry by which his entire product was taken, and with this desirable end in view, experiments were conducted and demonstrative installations were made without profit. These demonstrations captured new and repeat orders, and a profitable business of substantial proportions has resulted.

These illustrations could be multiplied many times. They all point to the application of intelligent study to the problems of a waning or handicapped business. New vitality often resulted.

Average Business Often More Efficient Than Large Corporation

I remember a statement made to me at one time by Henry R. Towne, the famous founder of the Yale Towne Lock Co. We were discussing the problems of large-scale industry and he expressed emphatically the opinion that small business should be, and often was, more efficient because of its adaptability and the ingenuity of the owner or manager who was able to give it his personal supervision. Yet it is true that more small plants fail because of incompetent management than for any other reason. Actual production operations are usually better carried on than the auxiliary, although essential, functions of purchasing materials, securing actual costs, controlling overhead expenses, and marketing the product. This means that the manager, usually a specialist in production, must broaden his grasp of the business, and if there is no opportunity to do that, he must strengthen himself with competent assistants.

There is pertinent to this theme an almost threadbare subject, but one that cannot be ignored even in as brief a discussion as this. I refer to cost-determining. A competent accountant in a plant is worth his weight in platinum. Not a faithful drudge of a bookkeeper, however loyal and dependable he may be in handling collections or the bank account, but an accountant trained in cost-keeping and who is willing to keep himself posted in the development of his art. There should be not only an analysis of manufacturing costs, but of lines of product and accounts.

THE author, who is vice-president of the Bowery Savings Bank, New York, was born at St. Charles, Mo., in 1882. He attended Cornell University and the University of Chicago, later studying law at Harvard and New York University. In 1903 he engaged in an investigation of industrial welfare work for the International Harvester Co. He became vice-president of the American Metal Co., Ltd., in 1916, serving until 1923, when he became third vice-president of the Metropolitan Life Insurance Co. He is the author of "The New City Government," published in 1912.

What Foundry Cost Studies Showed

The president of the American Foundrymen's Association lately cited an analysis of his company's costs for a period of three years as demonstrating the fallacy of the practice among foundrymen of basing costs on the price of metal. He found that metal represented only 18.8 per cent of the cost of the product while labor and management represented 50 per cent. Pricing is a correlative of cost-keeping and, if properly done, will relieve a plant of unprofitable business and enable it to concentrate on the type of work it can do best.

Next to cost-keeping, I place merchandising or selling as the field greatest in need of attention. There are numerous illustrations of intelligent methods now used in this field by all types of company. Hand-to-mouth buying has compelled attention to consumers' needs and habits so as to anticipate demand for prompt delivery. Whether a manufacturer distributes through jobbers, sells to a small number of users or markets directly, he should get up to date on marketing.

A Market Study That Increased Sales

I have in mind the case of a belting company, which did the following things to strengthen its market:

1. It analyzed old ledgers and listed customers.
2. It grouped its customers by industry and the use they made of the product.
3. Old customers were grouped by territories, and lists of prospective customers in the same or allied lines were made.
4. Calls were made in territories where the lowest expense per call could be maintained with a view to the largest probable amount of orders. Sales territories were gradually enlarged, and new customers were added and new uses of the product were developed. The result was an increase of 20 per cent in sales volume.

One more illustration, this having to do with market evaporation. "A" was a manufacturer of castings for wagons. The inevitable happened. Cast iron hardware was first resorted to for filling in, and then cast iron toys. Castings are made, assembled, painted and packed for shipment to the distributer. The firm specialized on toys that can be retailed for 10c., and consequently it has established a year-around demand from the ten cent stores. The plant keeps track of style changes; thus, ten cent automobiles are made each year according to a popular style of automobile for that year.

Cutting Costs Through Personnel Control

A word should be said about securing the cooperation of employees by the systematic development of personnel work. Such cooperation can be made to reduce costs as in the case of the American Chicle Co., where there is a close coordination between the production department and personnel control. In three years, the employment department reduced the plant force about 20 per cent, securing more production and reducing turnover 50 per cent.

On each Wednesday, a budget

of the working force is prepared on the shipment schedule for the following week, submitted by the sales department. An organization chart is prepared for each department corresponding with this budget. On Friday, each foreman receives his personnel budget. The number of machines of each kind which will be run is listed; the names of the girls who will run them, and their substitutes, and the quantity of work that must be turned out in the department. On the following Monday, the schedule goes into effect, and each morning the assistant personnel director checks up to see that the schedule remains in effect, at the same time taking the absence record.

Every Manufacturer Must Keep in Touch with His World

I have tried to indicate the need for alert attention to the refinements as well as the obvious commonplaces of management. A business man, especially a manufacturer, must keep in touch with his world. He should join his trade association, and if that is wanting, help form a local association of plants having management problems in common. He should read his trade journal and a good magazine on management. He should visit other shops and talk with men of similar responsibility. He should read the economic news in a good business paper and occasionally attend a convention where pertinent management questions are discussed. The small manufacturer needs to be a student of management as well as the technical aspects of his industry. He needs competent assistants, and he must take time to analyze his business periodically and thoroughly. He should take advantage of sources of technical and management information available for little or no cost, such as have been indicated, and he should learn to use the Department of Commerce, the universities, and such agencies as the policy holders service bureau of a large life insurance company, of which I advise him to inform himself. Above everything, he should make use of the services of a progressive bank equipped to help him study and strengthen his financial practices. He should budget his business.

If he will do these things, he will survive more difficult years than 1928 is likely to prove, and he will make a profit in ordinary years if his business is soundly conceived and economically justified. Not all manufacturing, any more than all other business, deserves to persist. Not all smaller businesses should remain independent. But at least no well conceived and efficiently conducted business is likely to perish or to be overlooked when consolidations are under way.

The smaller successful business is a great national asset and a great boon to its owners and managers. It is certainly worth all the energetic and alert attention that a capable executive can bestow upon it.

Study Your Business

I sum up what I have to say to the average plant owners and managers in the sentence: Study your business; study the methods of other businesses, especially those that can afford to experiment and have applied the results of experiment, and apply them, to the extent that your good judgment dictates, to your own business. Whether you are a practical man, a technical man, a combination of both, be a student also.

The American business man is hard worked, but he still wastes a lot of time in futilities. That is all right if he can afford them. If not, why not give one movie night and one lodge night a week to studying your business and like businesses?

How Ohio Plants Are Meeting Current Problems

BY F. L. PRENTISS

A SURVEY of the business outlook for the small or medium-sized plants in the metal-working field indicates that little has been done, in northern Ohio, at least, to work out constructive plans to meet a situation that is largely due to excess capacity. There are few complaints that the moderate-sized and small plants cannot compete with large ones. However, there is a continued tendency on the part of automobile manufacturers to centralize their manufacturing at their own plants. While this tendency is not new, it is still going on and is probably felt more by manufacturers in northern Ohio than elsewhere.

Smaller plants in the automotive field, such as stamping plants, find it necessary to adopt production methods and put in equipment that will enable them to produce economically, but they take big chances if they have to make large expenditures for conveying and other equipment for special work, because they never know how long they will have the contract for a particular job. If they lose it, considerable of their equipment may be rendered almost useless. For example, one company three or four years ago went to large expense in putting in complete foundry molding units for making certain automobile cylinder blocks.

THE author has been resident editor of THE IRON AGE *at Cleveland for 20 years, and is a close student of developments in the metal-working industry.*

Now it has lost this business, because with the building of the new foundry the motor car company will make its own cylinders. This shifting of work in the automobile field, however, does not always indicate that the motor car builders themselves can make parts cheaper than outside shops.

One factor that enters into the situation in respect to the small shop in the automotive field, particularly the stamping plant, is the price of steel. The automobile manufacturer, when it takes bids for work, asks the shop at what price it figures its raw material. If a price is named that is higher than that at which the automobile company is able to buy material in large quantities, the automobile manufacturer insists that the parts maker bring pressure on the mill to obtain a price equally low. However, handicaps in buying raw material do not seem to have been serious recently, because of the condition of the steel market.

Stamping Plants Seek Specialty Business

Faced with present conditions of excess capacity, metal-working shops are groping around in search of other products, preferably those that they can make on equipment they have, so that the equipment can be kept operating.

Some of the stamping plants that specialize on production work in the automotive field are turning their attention to specialties in order to have more varied lines of work and to fill in when the automotive industry is slack. One Cleveland company that is devoted largely to automobile parts has built up a satisfactory business in stampings for moving picture machines and has recently commenced the manufacture of all-metal folding card tables to take the place of wood tables commonly used. While this seems to be a rather limited field, it helps out.

Malleable foundries have been hit as hard as any industry by their excess capacity and some are getting into specialties to help them out, particularly during periods when the demand for castings is slack. These products include pipe hangers, truck wheels, conduit boxes for electric wiring,

and posts and panels for railings on highway bridges.

Ventures Into Specialty Field Not Always Successful

Contract machine shops also have been adversely affected, and operators of these shops say that they do not see much hope for the future unless they get into the manufacture of some line of special products. However, these ventures are not always successful. For example, a Cleveland machine shop developed a special machine used in the rubber industry—spent considerable money for patterns, etc.—and did remarkably well for a short time, but a change in the process in making rubber automobile tires made the machine obsolete. A complaint of the contract machine shop is that its business is overflow work and that automobile companies, particularly, do not farm out work unless they are very busy. Operators of small machine shops contend that large manufacturers often do machine work in their own plants to keep their own men employed when conditions are rather dull, although they could often get this work done outside cheaper than they can do it themselves.

Efficient Management Key to Success, Says Manufacturer

A northern Ohio company which might be classed as medium-sized and which is apparently a successful manufacturer of a varied line of products, including screw machine products, tanks and automobile and aeroplane parts, offered the following views on the outlook for the average plant:

"There is a field for the small or medium-sized plant if it is well managed and if it concentrates on one product. Good management implies low production costs brought about by proper plant arrangement and the use of modern labor-saving equipment. A small metal-working plant is in better condition to compete with a large one in any particular line if the small one is better managed than the large one.

"If a plant is quite small it cannot have separate departments for making different products, as each department requires proper supervision and men trained to do work in that department. It would not be advisable to switch foremen or mechanics from one class of work to another. If a plant is not large enough to be organized into departments for making different products, it should stick to one product. It is the ambition of about every small manufacturer to grow and get big, and many have been able to do so by confining their efforts to one line of products. Many of the large successful manufacturers in the metal-working field today started in a very small way and succeeded by efficient management. Many others are doing experimental and development work today in small shops which will eventually grow into big manufacturing companies.

"If a small manufacturer will concentrate on one product, he will be in a position to adopt production methods that will bring down his costs and enable him to compete with the large manufacturer. He should watch the new developments in labor-saving machinery. If a machine tool is brought out that will reduce his manufacturing costs and he installs that machine but his competitor does not, he has an advantage over his competitor to that extent.

A small manufacturer, if his plant is large enough to divide it up into departments, should diversify his products so that he can keep busy in some lines while others are slow. The new lines added may be either specialties or standard products.

"The small manufacturer is at a disadvantage as compared with a large manufacturer in that he has to pay more for some lines of material, such as cold-finished steel, tool steel and high speed steel. This is because the larger manufacturer is able to get lower prices by buying in larger lots. However, a shrewd small buyer can overcome this handicap to a considerable extent by closely following the market and finding what other consumers are paying for the same material. He can often get some concessions by pointing out to steel salesmen that a big competitor is buying material at a certain price and that if he is to keep in business and meet competition in the same line he must have as favorable a price.

"While an organization to carry out the details of scientific management is not practical in a small plant, the head of a one-man organization who has full responsibility for the operation of his plant, can by his efficient personal management attain the same results that are sought to be attained in a larger plant by the installation of a system of scientific management."

To sum up the views of this manufacturer, the outstanding factor in the successful operation of plant, whether small or large, is efficient management. The success of the plant depends on this. He used the term "efficient management" in a broad sense, to include adoption of production methods and the installation of up-to-date equipment which would bring down the costs of production to a minimum.

A Practical Management Program for a Small or Medium-Sized Company

IN a period in which the pressure of competition has been steadily increasing and small plants, as well as large ones, have been confronted with the necessity for greater efficiency, attention has been focused on management. In the smaller plant, where close association between employer and employee still prevails and where the initiative and enterprise of both are usually of a high order, there is still considerable skepticism regarding the employment of many of the scientific management mechanisms that have found their greatest development in large organizations. The smaller manufacturer knows that he must make further gains in the battle against costs, but he hesitates to reorganize his management methods for fear of burdening himself with a cumbersome and unwieldy routine, unadapted to his needs.

In an effort to clear the atmosphere for manufacturers of this class, THE IRON AGE interviewed F. W. Shibley, vice-president Bankers Trust Co., New York, a keen student of scientific management and thoroughly familiar with its practical application. The questions submitted to him, with his answers, follow:

F. W. SHIBLEY, who expressed his views in this interview, is vice-president of the Bankers Trust Co. of New York, with which he has been connected since 1920. Before that time he was for over 20 years an investment banker for his own account.

A director of several large industrial corporations, Mr. Shibley has had the opportunity, both as a banker and through participation in the management of many industries, to gain a practical knowledge of industrial operations. During the late reconstruction period he joined actively in the reorganization of several important manufacturing corporations.

"To what extent are the principles of scientific management applicable to a small or medium-sized plant?"

"This is an age of specialization in industry," replied Mr. Shibley, "a specialization which is being constantly extended and refined. The trend is toward larger units of operation in order to secure the benefits of mass production in the reduction of costs and to employ the services of executives possessing the exceptional ability to comprehend, organize and control the operations of a large business on a scientific basis.

"Nevertheless, human nature

does not change with fluctuating economic conditions. There will always be the desire on the part of a great many men to act independently of the economic trend and to manage and control an enterprise of which they are the dominating force, even though that enterprise is comparatively a small one. Such a business can attain a success if well managed, and it can attain a very considerable success if operated under the principles of scientific management, which imply an accurate knowledge of markets gained through systematic sales research and resulting in an accumulation of ascertained facts on which to base an annual forecast of probable sales by units and dollars, planned production based on such a forecast and control of operations as planned through a budget, corrected, if such correction is needed, at least monthly.

"No business is too small to require good management, and no management is so good that it cannot be improved by utilizing the principles of scientific management."

"Is there danger of building up too cumbersome machinery for production control?"

"Yes, if the executive management is unintelligent and inefficient, in which case the system is of little value. Under a management which understands the system, overhead can be reduced greatly, for it demands that heads of departments all down the line function properly, and when they so function, red tape with its excessive clerical expenditures disappears. The more highly refined a complicated machine becomes, the more efficiently and economically it operates. Scientific management demands that the highly paid executive heads of departments operate and control the business, doing exactly what they were hired to do."

"To what extent is it economical to scrap old equipment and plant and replace with new?"

"The limiting factors are cash working capital and the economic position in trade of the product. A new machine, as a general rule, must justify its replacement of an old one by effecting a saving equal to its cost in a period of from 5 to 10 years. In this age of mechanical progress obsolescence is much more rapid than in previous times. The economic position of the product in trade ties into this formula and becomes an essential part of the problem, for just insofar as the market potentialities of a product are assuring as to price and volume can management venture beyond the dead line of the definite amortization period as above stated."

"Is there danger in investing too heavily in special-purpose machinery?"

"There is grave danger. The reason is outlined in the answer to the previous question."

"Should the smaller plant regard as one of its advantages the lack of excessive specialization that makes it difficult and exceedingly expensive for a mass production shop to change its product in response to new demands?"

"Yes. Mass production is exceptionally effective when mass buying is obtainable. It is particularly the province of the large industrial enterprises. It does not lend itself to a small operation except insofar as the flow of production along a proper line of machinery is concerned. The profit of the small or medium-sized plant is not to be looked for in the production of staples made in quantities and sold under fiercely competitive conditions, but in specialties, the general market for which seems to be broadening.

"It should be the study of management to make the small or medium-sized plant as flexible as possible so that it will be prepared to respond quickly to style changes in its present products or to adapt itself to new products in its line."

"What kind of cost-finding system is best suited to the small or medium-sized plant?"

"The system which will be best adapted to establishing a standard cost for each item of operation under the terms of a flexible budget and which will tie into the balance sheet accurately each month. The sales dollar is a true measure of costs, and monthly comparison of actual costs with budgeted costs and standard costs will result in a short time in a reliable and accurate cost system."

"To what extent is budgeting practical?"

"Just as the forecast of sales is the dominating factor in the system of scientific management the budget is the controlling factor. It maintains the entire system in balance and is indispensable. Without the budget there cannot be effective scientific management. Opinion will dominate, not facts; therefore the budget is essential, and the cheering fact is that, being less complex in a small business than in a large enterprise, it is more understandable and its inevitable conclusions more convincing and effective."

"What purchasing policy should be followed by the smaller manufacturer? To what extent should he buy raw materials in quantity? Are zero inventories of greater importance than low material costs?"

"Purchases of materials should be made only as required by the terms of the production budget. If the manager of a business possesses sufficient excess working capital to enable him to speculate in, say, pig iron or cotton, that is his privilege as a free American citizen. If he borrows money for this purpose he does so at the risk of the solvency of his business. Under planned production and budgetary control an inventory can be turned much faster than formerly. The quickly revolving inventory minimizes even the advantages of speculative purchasing.

"In any event raw materials bought in excess of production requirements should be carried at the expense of the capital account and not the operating account. In the past, costs have been distorted both up and down through speculative purchasing of raw materials."

"What can the manager of a small or medium-sized plant do to improve his selling methods? Should he seek stabilized demand through developing a variety of products? How can he more intensively cultivate old markets and develop new ones? What advertising methods should he use? Should he support group advertising?"

"Let him study his markets and specifically let him gain a personal knowledge as far as possible of every factor entering into the distribution of his products. He must answer each one of these questions for himself. He cannot answer them intelligently unless he makes such a market study as has been suggested. Market study is not only a matter of statistics, but one of psychology. He will doubtless discover that he should develop the smallest possible number of products and that he should employ only such advertising methods as shall serve to keep his company actively in the minds of the distributers of his products or shall prove effective in selling them to consumers. He will ascertain undoubtedly that trade paper advertising is the best medium for keeping his company and its products before the trade and that applied advertising, as a sales stimulant, can be made very effective if done after intelligent market study. Advertising is being applied for the direct purpose of producing sales of a specific article in a specific market with remarkable results.

"Your last question embraces the entire territory of sales research and market study. Many managers of small plants have felt that sales research and market study were only for great corporations. It is decidedly unprogressive in them not to strive to follow the lead of the great successful industries and to learn all that is humanly possible for them to learn of the best methods of modern merchandising and distribution."

Migration of American Industry

Movement Traceable from East and West Into Indiana-Ohio-Michigan Section—South Gaining in Importance

BY SIDNEY G. KOON*

THERE have been many statements in the past year or two to the effect that the industrial center of the United States, which long has been moving at a slow pace toward the setting sun, had started to retrace its steps eastward. Specific instances have been cited of industries moving back toward the point of origin of American manufacturing and certain hazily defined trends have been discussed. In an attempt to trace this movement quantitatively several analyses have been made which are covered in some detail in later paragraphs.

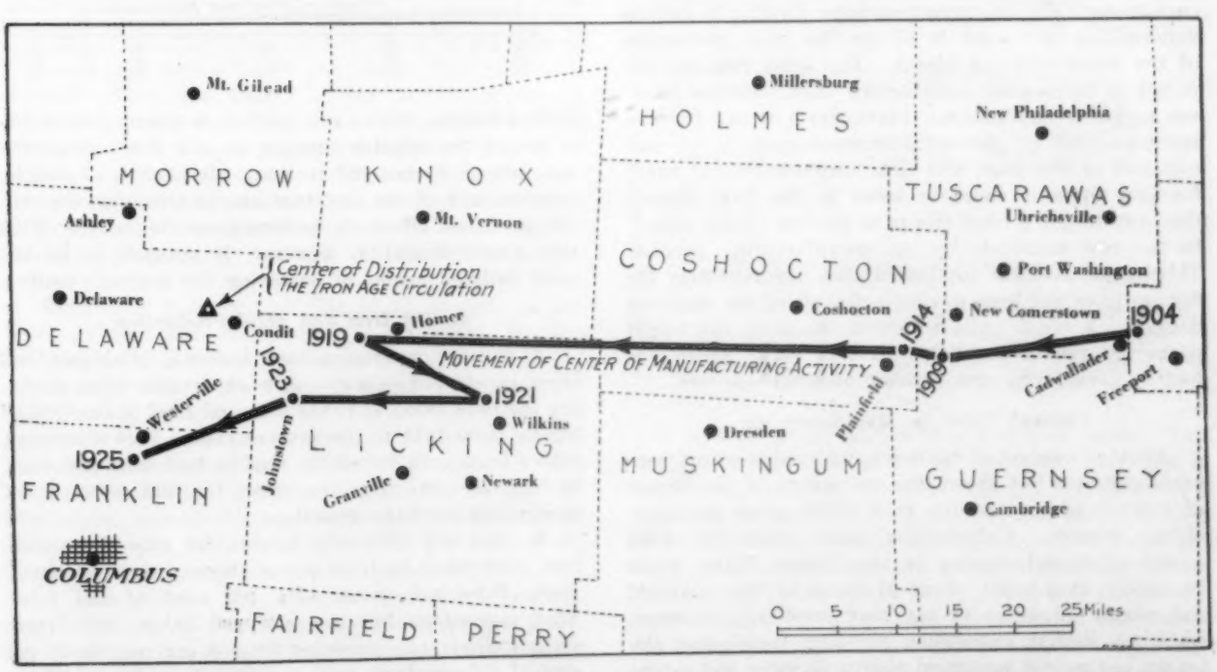
Among the statements indicating a migration of industry was one by Hon. Herbert Hoover, Secretary of Commerce, in an address before the Mississippi Valley Association, Nov. 14 last. A portion of that address follows:

> "While the Panama Canal has carried great benefits to our people, we cannot ignore the fact that it has contributed also to distort the competitive relationships of the Mid-West and our seaboard business and industry. It has drawn the east and west seaboards much closer together by greatly decreasing transportation costs, and therefore tends to draw an area of Pacific's business, formerly enjoyed by the Mid-West, toward the Atlantic States. We can roughly visualize the combined effect of the canal and higher rail rates if we set up a new measuring unit in the shape of the number of cents which it takes to carry a ton of staple goods at present rates.
>
> Using that measuring rod and taking the cheapest routes, we find that before the war New York was 1904c. away from San Francisco, while now it is only 1680c. away. But a given Mid-West point, which was 2600c. away from the Pacific Coast before the war, is today 3114c. away. In effect this Mid-West point has moved 514c. away from the Pacific Coast, while New York has moved 224c. closer to the Pacific Coast. A similar calculation will show that in the same period this Mid-West point has moved 694c. away from the markets of the Atlantic seaboard and South America.
>
> All this causes certain types of Mid-West business to migrate to seaboard. It steadily tends to establish manufacture nearer to seaboard and farther from the heart of agriculture, to the mutual disadvantage of both. It likewise has a tendency to limit the area of Mid-West wholesale distribution. Individual merchants and manufacturers in the interior can give many instances of it all"

Another straw, so to speak, was made public by the Department of the Interior on Nov. 18. This states that the center of production of electricity by public utility power plants, after having moved westerly between 1907 and 1917, turned toward the southeast between 1917 and 1926.

Figures compiled by A. H. Horton of the United States Geological Survey located that center in 1907 at a point in Lake Michigan about 45 miles northeast of Chicago. Ten years later it was about 65 miles west by north of Chicago, "having moved about 85 miles in a southwesterly direction. In 1926 it was 55 miles west by south of Chicago, having moved about 20 miles in a southeasterly direction." During

*Associate editor THE IRON AGE, New York.

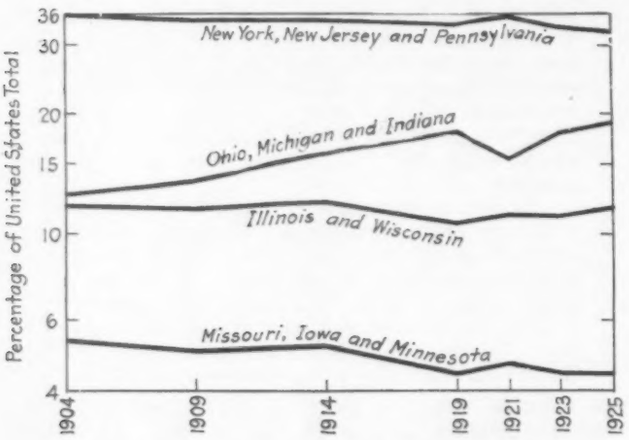


TWENTY-THREE Years Ago the Center of Manufacturing in the United States, as Shown by Distribution of Wage Earners, Was About 95 Miles East by North of Columbus, Ohio. Its progress westward with the passing years is traced on the map. It now is about 9 miles from the center of Columbus. Not far away is the center of THE IRON AGE *circulation*

this period of 19 years the output increased from 10.6 to 73.8 billion kilowatt-hours, or nearly 600 per cent. Population increase during the same period was given as 34 per cent and per capita use of electricity as 122 kwhr. in 1907 and 630 kwhr. in 1926.

Methods of Studying the Movement

BOTH general manufacturing, as reported by the United States Census Bureau, and the production of iron and steel, as reported by the American Iron and Steel Institute and THE IRON AGE, have been analyzed for the purpose of determining the movement of industry. In the iron and steel field the production of pig iron has served as the basis for one study, while the production of rolled iron and steel products is the foundation for another. General manufacturing has been taken up in an analysis which follows State lines.



ELEVEN States Produce Two-Thirds of Our Manufactures. Their relative outputs are shown in the two diagrams on this page—that above being figured from the "value added in manufacturing," while that at right is based on the number of wage earners. Both show that the heavy gains of Ohio, Michigan and Indiana are at the expense of both the eastern and western groups

It has been covered also on the basis of production in large cities, principally so that the eastern and western sections of Pennsylvania, for instance, might be separated, and similarly in some other cases.

Several methods of attack are available in any such study. The one occurring most directly to anyone undertaking this work is to use the total production of the manufacturing plants. For some reasons this is not a thoroughly satisfactory base, because there are so many duplications, particularly where the finished product of one establishment goes in as raw material in the next, and thus through several ramifications appears twice or more in the final figures. One way to get around this is to use the "value added" to the raw materials by the manufacturing process. This avoids all such duplication, but unfortunately the figures have not been available for all of the analyses desired. A third base, which in the long run ought to be practically parallel with the "value added," is had by considering the number of wage earners.

Central Point in Manufacturing

Another method of approach, which disregards separate districts but shows the movement of the center of activity of the country as a whole, gives an interesting answer. Calculations made from the 1904 census of manufacturing in the United States place its center at a point about 91 miles to the eastward and nearly 19 miles to the northward of Columbus, Ohio. A similar calculation for 1909 shows that the center had moved westward nearly 17 miles and southward about three miles, being correspondingly closer to Columbus.

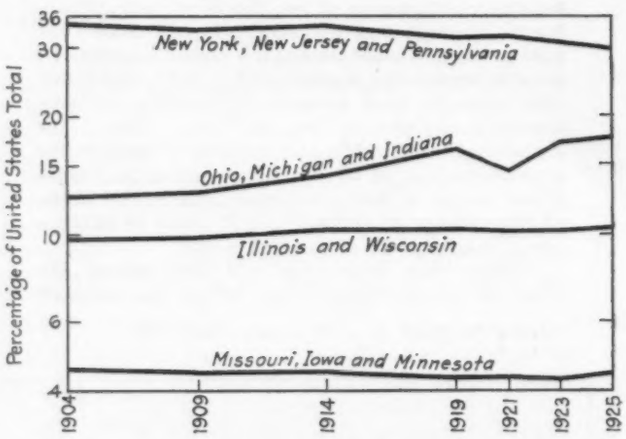
A shorter movement brought the center in 1914 to about 71 miles eastward and 17 miles northward of Columbus. The distance moved in that half-decade was only about four miles. A large jump was made in the next five years, placing the center in 1919 about 23 miles to the eastward and 18 miles northward from Columbus. During the next two years the movement to the west was interrupted, for the center, by 1921, had moved 11 miles farther east and five miles farther south.

By 1923 this eastward digression had again been reversed, the movement placing the center about 17 miles eastward and 13 miles northward of Columbus. In 1925, which is the latest date for which figures are available, the center had approached closely to the outlying portions of the Ohio capital. As nearly as it can be calculated, it was about 3½ miles to the east and 8 miles north of the center of the city.

It is interesting to note, in connection with the recent positions of this center of manufacturing activity of the United States, that the center of distribution of the circulation of THE IRON AGE also is close to Columbus. Figures for the first half of 1927 show that location to be about 10 miles east and 21 miles north of that city. It thus is in the same direction from the city as is the manufacturing center, and the two are but 15 miles apart.

Comparisons on Percentage Basis

TO eliminate the uncertain influence of varying business conditions comparisons have been made, not of the total output or number of employees or dollar value, but of the percentage of such quantities which each State or section contributed to the total for the



United States. Using this method, a clearer conception is had of the relative changes up and down as among the various States and sections. It cannot, of course, take account of the fact that changes in business conditions do not affect all sections proportionately. With this single disability, however, it appears to be the most rational means of obtaining the desired result.

Rolled Iron and Steel Production

A definite movement into Indiana, Michigan and Ohio, considered as a group, is observable when studying the production of rolled iron and steel in the United States from 1911 to the present time. This movement comes from both directions, that is, both east and west. It does not come from the south, for that region itself is showing a steady growth.

In 1911 and 1914 (the figures, for ease of calculation, were taken at intervals of three years). Pennsylvania furnished about 49½ per cent of the total. That percentage has now dropped below 39. Meanwhile Indiana has increased from 6 per cent to 13 per cent of the country's total and Ohio has advanced from 18 to about 22 per cent. As a result, even though Illinois has shown a drop comparable with that of Pennsylvania, the group of three States—Ohio, Indiana

and Illinois—has now passed Pennsylvania, having a total of 42 per cent of the country's aggregate output in 1926 against only 34 per cent in 1911.

Conditions in the South show an uninterrupted gain, from less than 3 per cent in 1911 to almost 5 per cent of the total in 1926. This includes all territory south of the Ohio River, with the exception of the two Virginias. It reflects the growth in importance of the Birmingham region particularly.

Movement of Manufacturing in General

Concentrating our study upon that portion of the United States lying west of New England, north of the Ohio River and east of the Missouri River, we have a territory comprising 11 States, forming the most intensive large manufacturing area in the country. They cover 18½ per cent of the nations expanse, contain 49 per cent of its inhabitants and produce 67 per cent of its manufactured products. Three or four of the States included are large factors from the agricultural viewpoint, but contain heavy manufacturing activity also.

Taking the so-called "empire group" of New York, New Jersey and Pennsylvania, there has been a drop from 34 per cent of the total wage earners in the country in 1904, 1909 and 1914 to about 32 per cent in 1919 and 1921 and some 30 per cent in 1923 and 1925. Accompanying this decline in the eastern States of the region under discussion is an increase in Ohio and Michigan from 10 per cent of the country's total in 1904 and 1909 to about 14 per cent in 1923 and 1925. In both cases the movement was irregular, but the net change was a considerable drop in the empire group and a corresponding increase in the Ohio-Michigan group.

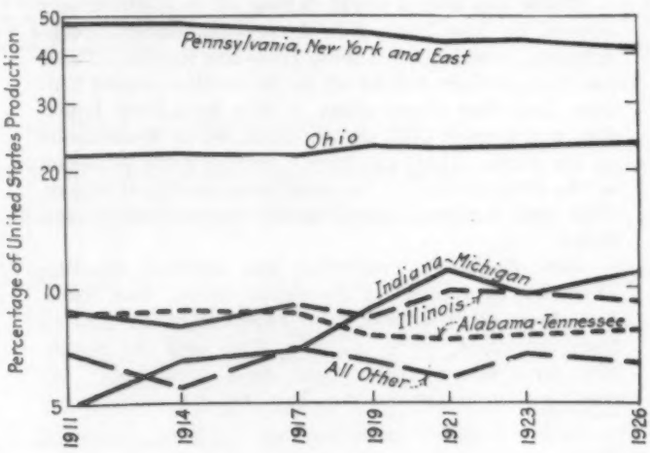
Regarding Indiana and Illinois as another group, their 10 per cent of the total employment in 1904 to 1914 inclusive has increased to 10¾ per cent in the two most recent years. This moderate gain has been made mostly by Indiana, which has gone up from 2.84 per cent of the total in the three earliest years to 3.33 per cent in the two latest years. The territory west of the Mississippi, comprising Missouri, Iowa and Minnesota, considered together with Wisconsin, has held practically uniform at about 7¼ per cent of the total number of wage earners of the country.

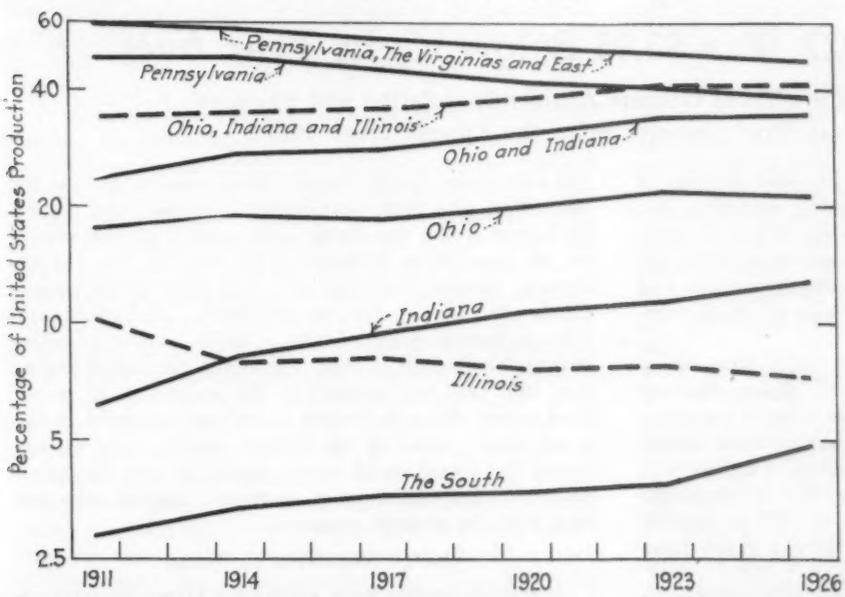
It thus follows that, disregarding New England, the South and the Far West, the Ohio-Michigan group has benefited in expansion of industry at the expense chiefly of the empire group. This study does not show, in the same way as with the rolling mill study, a movement from both west and east into the middle section. It does show, however, that that middle section is growing faster than the sections surrounding it and to the (relative) loss of some of them.

Study of the Cities

More than four-ninths of all products manufactured in the United States are produced in the 68 cities which had in 1920 a population of 100,000 or more. This does not include production of suburban areas, and in particular, so far as the steel industry is concerned, it does not include the production of the large number of small cities containing steel plants. Bethlehem and Gary and Lackawanna are notable examples. These 68 cities are here considered as divided into six groups, each of from 10 to 14 cities. Analysis of the changing volume of manufacture in the manufacturing census years 1914, 1919, 1921, 1923 and 1925 is considered for these groups separately.

In some respects the study of production in the principal cities has yielded results similar to those in

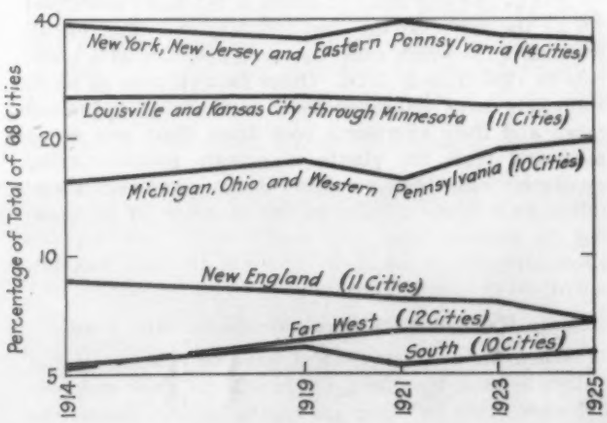




PIG Iron Production, by Districts, Is Traced Above. Indiana and Michigan, as well as Ohio and Illinois, have been gaining at the expense of Pennsylvania and the East

At Left Is the Production of Rolled Steel in the United States. Ohio and Indiana show huge gains in their proportion of the total—at the expense, mainly, of Pennsylvania and Illinois

Below Is the Manufactured Product Showing of 68 Cities, Grouped in Six Sections of the Country



preceding paragraphs. Taking the census figures for 1914 to 1925 inclusive, the cities showed their highest proportion in 1921, with 46.98 per cent of the total. Their lowest came in 1925, with 44.81 per cent. All of the other census years showed between 45 and 46 per cent.

There has been a slight falling off in the territory covered by New York, New Jersey and eastern Pennsylvania, in which 14 of these cities are located. There has been a slight falling off in the section around Chicago, including eleven cities, in that area from Louisville and Kansas City, on the south, up to Minneapolis on the north. There has been a decided gain, as shown by the other studies, in the area comprised by Michigan, Ohio and western Pennsylvania, represented by ten cities.

New England's proportion has declined steadily, as shown by records of its eleven cities. The South has shown a moderate gain, represented by figures from ten cities, while the Far West and the Southwest have shown a consistent gain considerably exceeding that of the South. This western area, which contains twelve of the cities, has almost reached the New England percentage of the total, although in 1914 it was only six-tenths as great as New England.

To the tremendous expansion of the automobile industry may probably be attributed the movement which we have traced. Michigan, Ohio and Indiana, considered as a group, is the principal and predominant seat of that industry and its main auxiliary services of supply. And it is precisely into that area that we have found industry going from contiguous areas on either side.

One element which may be noted lies in the relative recession of industry in that area in 1921. Examination of automobile production figures shows a correspondingly heavy reduction in that year in the production of cars. Only 41 per cent as many cars were produced in 1921 as in 1923, whereas for manufacturing as a whole the ratio was 72 per cent. The tie-up between that one industry, which now appears to have reached its full growth, and the relative movement of manufacturing activity into the area dominated by that industry is striking.

Steel Scrap in 1927 Was $3.35 Below Eight-Year Average

New Conditions in the Trade Operate Against Speculation and Fluctuating Prices—Last Year Average Price the Lowest Since 1921

CHANGING trends in the buying and selling of scrap iron and steel, upon which attention was focused in our Annual Review Number of Jan. 6, 1927, have operated throughout the past year to minimize the high degree of speculation which formerly existed and to establish scrap trading upon a basis of quick turnover, small profits and low prices.

In only one year since the war, 1921, have scrap prices averaged lower than in 1927. Heavy melting steel, the grade in which there is the largest consumption, averaged $1.48 lower in 1927 than in 1926, taking prevailing quotations in the Pittsburgh, Chicago and Philadelphia districts as the bases for a composite price. This composite price was $14 in 1927 as against $15.48 in 1926, while the average for the years from 1919 to 1926, inclusive, was $17.355.

The downward trend of prices is not alone accounted for by the fact that the steel industry and other metalworking units which consume scrap operated at a lower rate in 1927 than in 1926. Other factors were at work. Railroads have improved their methods of gathering scrap and their shipments both from their own scrap piles and from the plants of private manufacturing companies have been prompt. Scrap consumers themselves have taken a hand in the situation by purchasing in moderate-size lots and thereby avoiding the speculative flurry which at times in the past has followed every large transaction.

Scrap Handled More Economically by Steel Plants

When brokers and dealers have only moderate-size orders in hand they do not scramble to cover and outbid each other in their anxiety to protect themselves against loss. Steel companies have quite generally adopted the policy of releasing orders or shipping instructions only as they need material and this regulation has resulted in steel plant economies because much of the scrap coming into the steel plants is unloaded directly from cars to the open-hearth charging boxes instead of being piled in the yard for rehandling as required.

While there has been no oversupply of heavy melting steel of the best grades, the supply of secondary grades has been very large at all times and the market has not been affected by the speculation which usually has accompanied any signs of a shortage.

Conditions in the trade, while operating largely to the advantage of the buyer, have reduced profits for the seller, and most particularly for the yard dealer. In former years the scrap yard existed almost wholly on the speculative features of the market, but the extremely narrow margins have left little or no opportunity for the dealer to speculate. Railroads and manufacturing companies to a large extent are preparing their scrap so that it is ready for the charging box, and this has worked to the exclusion of mixed yard scrap, which in former years was prepared in the scrap yard. Some of the largest dealers have discontinued the operation of yards, and it is only the small dealer, with a minimum of overhead expense, who can cope with the present situation.

Large Shipments by Water

Water shipments have assumed a larger importance in the past year. The Bethlehem Steel Co. has moved not less than 125,000 tons from Detroit and other cities on the Great Lakes to its plant at Buffalo, whereas in the preceding year it moved only 50,000 tons in like manner. In addition to Bethlehem's water shipments, the Otis Steel Co. brought 20,000 tons of steel scrap from Detroit to Cleveland, this being the first time that scrap from Detroit was moved to Cleveland by water. These water shipments have operated to the advantage of the purchasers in keeping prices low at the delivery points, water transportation being so much cheaper than haulage by rail.

A transatlantic shipment of alloy steel scrap from England to a Chicago steel plant, consisting of 1200 tons, was a departure. Other boat loads are to follow, relieving in Chicago the shortage of alloy scrap, which is produced there only in small quantities, and therefore is not usually separated from other steel scrap.

The Eastern market situation has been changed by the adoption of more stringent requirements by the Bethlehem Steel Co., the largest Eastern user of scrap, and further by the virtual withdrawal as a buyer of the Sparrows Point plant of that company, due to increase in Bessemer steel-making capacity to an extent which makes Sparrows Point self-contained as to scrap.

Conditions at the opening of 1928 seem to indicate that market advantages will continue to lie largely with the buyers rather than with the sellers of scrap. There is nothing at this time to point to scarcity of supply or high prices.

American Foundries Through European Eyes

Democratic Social System Mainspring of American Achievement—Sees New Market for Malleable Castings—Suggests Electric Forehearth—Stresses Need for Single Cost Language

BY MORTEN GRINDAL*

THE foundrymen's convention in Detroit in 1926 was a red-letter event in the history of international relationships in the foundry industry. For the first time organized bodies of leaders from foundries in a large number of countries came to study American plant practice. Their praise of the unforgettable days they spent while the official visit lasted has been voiced in numerous ways and in superlative terms.

The writer had the good fortune to be one of the number of delegates. While he participated in the extensive program before, during and after the Detroit meeting, he feels that the many months he spent later in the United States were of much greater value to him. It was literally impossible to digest fully the large program rushed through in the comparatively short time of the convention week. In his subsequent sojourn the writer visited 51 American foundries and one by-product coke plant. He talked with more than 1000 foundrymen, and had ample opportunity to study the many details in all conditions of American work and life which have a bearing on the resulting prosperous conditions in that field. If a short account of his experiences and views may be of any value to his American colleagues, he feels that but a small repayment is made for the very cordial and courteous treatment he received from every one of the large number of leaders of the American foundry industry with whom he came in contact.

The visits included foundries of all branches of the industry and covered plants of widely varying capacities—from an artisan's humble works in the Watchung Mountains, run by his wife, his son and himself, to the other extreme of Ford's immense foundry in the Fordson plant. The list contains a large number of jobbing foundries with the most diverse types of equipment and production—stove foundries, radiator shops, foundries for soil pipe and fittings, shops for a variety of classes of mass production using different conveyor methods, plants producing pipe in vertical sand molds and also by centrifugal methods, a number of malleable cast iron foundries, steel foundries run on a production basis and for jobbing purposes and, finally, non-ferrous shops in all branches of the field, including the manufacture of die castings. The melting units in the plants visited include virtually every known practice: the cupola, the crucible, the converter, the air furnace, the open-hearth furnace, the electric furnace and, in some cases, a combination of some of these units.

Freedom from Caste Our Greatest Asset

THE problem the writer would like to discuss first is one common to all American industries, and one which was talked about in almost every foundry he visited:

Why is it that the European workman produces more in the United States than he does in Europe? And hence, why is America the more prosperous?

Many delegations have come to America to study this question, and many learned reports with a mass of statistics have been submitted to the various local authorities. And nothing more has come of it. Not

*Lillehammer, Norway.

one of these reports has—so far as the writer knows—touched upon what he considers the basic difference between the conditions of life in the old and the new world: the social system.

America, being fortunate in not being tied down to traditions developed through thousands of years of history, bases its activities on the spirit developed by the pioneers in their westward march of conquest, with the individual depending entirely upon his own efforts to achieve success and seeking cooperation for defensive purposes. It was the old law of the survival of the fittest, applied to the extreme. It is these fundamental principles, but little infringed on by the American society of today, which no doubt constitute the main reason for the universally recognized leadership of American enterprise.

It is easy to point to the rich natural resources of the broad American continent, but the country in Europe which possesses the most valuable resources is governed by socialistic principles. American society builds on the instinct of individual self-support: Every man for himself—sink or swim. Again, the road to the top is open to each one who is able to climb it, unhampered by conditions of breed or creed. A man's success depends mainly on his achievements, and the results he can show will determine his position in the scheme of things. The very ablest become leaders and in a nation with 120 million people there is bound to be a large number of eminent brains. Thus the American system will, without much friction, cause the individuals to segregate into the places in the social scale where they will be of the greatest service to the community and to themselves. The unlimited opportunities offered in a nation where even the chosen leading executive may come from a humble home in a country valley is naturally the best tonic for concentrated action that may be offered any ambitious youth. America thus makes the most of the greatest natural resource in any country—the human brain.

For the sake of comparison, consider for a moment the class system ruling the old countries of the world, cast to its present mold thousands of years before modern industrialism was ever dreamt of—where leaders of society and enterprise are selected by birth and not by ability, where promotion depends more on friendship and intrigue than on natural gifts, where the laborer at the bottom rung of the ladder recognizes the impossibility of ever getting a fair chance, and where he feels and believes himself abused by the community in which he lives and, embittered, resolves to be of as little service as possible. There the friendly spirit between producer and executive met with in almost every American plant is an unknown quantity. A superintendent in a malleable cast iron plant in the United States remarked to the writer: "The men in this shop are my best friends. We live for 10 hr. every day together. If these fellows aren't my friends, I have none." The writer could have no better wish for the future of the foundry industry in Europe than that such a remark could be heard as a common occurrence among the sand heaps in the shop. Is it any wonder, then, that the European workman, finding himself freed from the bonds which tied him down in his native land, feels the buoyant effect of his economic liberation, directly measured by his ability and willingness to forge ahead? Is it surprising that he works, and works hard?

American Molder Aided by Pneumatic Equipment

ALTHOUGH the American workman admittedly shows a general willingness to produce to the limit of his capacity, it has naturally been the directing intelligence of inventive spirit and administrative ingenuity which has been responsible for the great evolution in the American foundry industry in the last few decades. To aid him in his efforts, the American foundryman has today about 4 hp. at his elbow, with probably even more mechanical power per capita to come.

The first serious efforts to improve on the old method of making molds by the use of hand ramming only resulted in the construction of a number of different types of machines. The hydraulic power for molding purposes, commonly used in European countries, has evidently but a limited application in America. Though cheaper in installment and running cost, the hydraulic system has been discarded in America in favor of pneumatic power, because of the greater flexibility and speed of production made possible by use of the latter method.

Air Leakages Impede Molding Operations

It is unfortunate, though, that leakages, which never could be tolerated in a liquid pipe line, are a daily occurrence in almost every foundry having an air compressor. Air is free, and thus it is not considered of much importance that losses occur almost every minute of the working day. It is strange that such a universal slackness is shown in this connection, as it is common experience that the pressure drops below the required minimum. The writer does not remember having spoken to any foundryman who did not admit having an insufficient surplus of compressed air in his plant.

While the molding machine originally was designed for handling molds on a production basis, the sorely felt need for mechanical devices which could assist the highly paid skilled molder to increase production has resulted in at least two types of useful equipment: the jolting machine for jobbing work and the sandslinger.

Forecasts Further Improvement in Molding Machines

In recent years the design of molding machines for production work has shown few changes, seemingly indicating that this type of equipment has reached full development. It is more likely, however, that the next few years will show greater changes in molding methods than have been witnessed in any previous corresponding period. First, consider the smallest type of work, as represented in malleable castings. The molds are almost exclusively made on the power-jolt-squeeze hand rollover and hand, pattern draw machines. These machines are fast, provided the operator is a strong and speedy workman. There is really no reason why machines could not be designed so that the molder would do nothing but move levers, set cores and lift the finished and closed mold to the floor or place it on a conveyor. With all the engineering attention this problem at present receives in America, it is but a question of time when it will be solved.

The type of work requiring a flask for each mold is a different proposition. The sandslinger solves the problem to a certain extent, as almost any mold can be rammed with the aid of this machine. It can do no more, however. Also, if it is possible to ram a mold on a jolting machine, that method will in most cases be the faster, and jolting is the best known way of making a uniformly rammed mold.

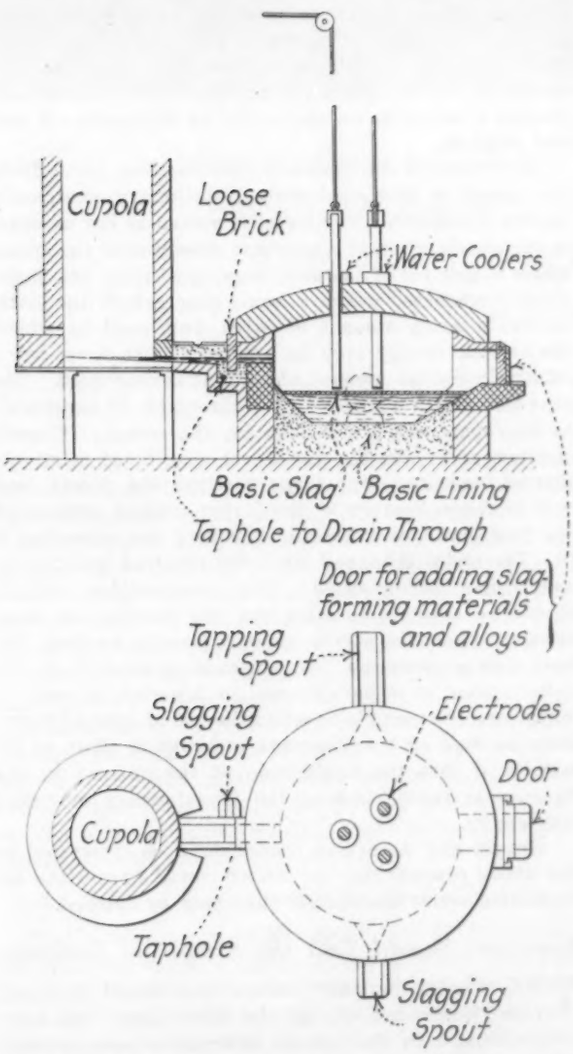
Now, as to the present position of the jolt machine for jobbing work: Generally speaking, the largest work is made on a plain jolt table, while at least one concern builds a rollover pattern draw machine suitable for medium-sized and even fairly heavy work. There seems to be room for further progress. The ideal molding machine for the jobbing foundry will probably be a jolt machine with mechanical devices to ram the upper part of the flask at the same time that the lower section is packed by jolting, the machine then rolling the flask over and drawing the pattern from the mold.

Nothing is impossible in the engineering world so long as the laws of nature are followed. There is no reason why the vast sums of money available for research work in the United States industries should not be partly utilized to devise the construction of a ma-

chine for the jobbing foundry which—utilizing the present flask and pattern equipment—will ram the mold, draw the pattern and assemble the parts, either on the machine or on the floor. When the possibility of further progress is admitted, real advance is but a question of time.

American Foundry Superior in Materials-Handling Methods

FOREIGN foundrymen witnessing at close quarters the American foundry industry in the midst of an unprecedented development cannot help but notice the many different ways material is handled in the various foundry departments. It is a well known fact, that often more than 100 times the weight of the finished casting must be handled in the routine of the work.



An Electrically Heated Stationary Forehearth Connected with a Cupola by a Self-Slagging Spout. The metal runs in a constant stream through the spout, where it gets rid of acid slags, and enters the basic-lined forehearth. The purpose of the forehearth is to superheat, deoxidize and desulphurize the metal

One of the most striking differences between American and European foundry practice is the way American foundrymen have tackled the problem of relieving the workman from the backbreaking labor of handling sand and other materials, as well as the problem of intra-plant transportation of castings. The future economic position of the foundry industry will mainly depend on the further developments in this field. The ways the problems may be solved seem to be legion. While a certain uniformity is noticeable in molding machine construction and uses, a pronounced individuality is plainly seen in the manner various firms have tackled their problems in handling foundry materials, perhaps naturally so. Conditions in various plants are so different. Again, firms are generally large enough to afford to spend the money for the brains, labor and materials required for the development of new methods.

American "Open-Door" Policy Contrasted with European Secrecy

A suggestion that inventors should take a 10-year vacation was recently made. People should be given time to catch up with progress. Any foundryman visiting half a hundred American foundries knows that there is a real reason for such a proposal, even though it is not practicable. The multitude of improvements and devices at present flooding American foundries paint a picture of the riotous, rapid onward rush of the current of progress. In spite of the broadminded policy of the open door almost universally adopted among American foundrymen, it has not been possible for the various leaders to absorb and utilize in their own plants the many different details developed in the plants of their colleagues. People in Europe have—to their own detriment—partly believed in secrecy. The lesson taught during the Detroit convention will go far to change the views of the European foundrymen in this respect. "Why should I not let a competitor visit my plant? If I do not learn from him more than he gets from me, I am to blame." This was one of the many sensible remarks heard in America.

Molding Sand—The Key to Closer Limits in Castings

A FEW words about molding sands—by far the most important of all foundry materials—may not be amiss. America has an enviable resource in a great variety of splendid molding and coremaking sands. The strongly bonded, yet fairly open, sand which is available has made it possible to subject the molds to far rougher handling than generally would be possible in Europe. This is highly important for the continuous foundry with its multitude of conveyor systems. The chemists have, however, through their analytical investigations made synthetic production a paying proposition in many fields. Apart from the fact that the natural resources of molding sand some day will be exhausted, there appears to be an alluring fascination in the problem of repeating the work of nature and improving upon it, by building in the factory a sand with ideal properties. The writer has seen charts of daily tests from a production foundry running entirely on a molding material built up of pure silica sand and high-grade fire clay. Although silica sand seems to be the natural basic material, it is by no means established that clay is the only good bonding substance.

Work in this field has only begun, and it is impossible to say what results research workers may achieve within the next few years. Just consider the problem of the sand burning on, or at least adhering to, the casting when removed from the mold. Cement is sometimes used to coat the mold. A titanium-nitrogen compound has been found that gives even steel castings a clean surface in green sand molds. In spite of the very difficult nature of the task, the writer believes that some day castings will uniformly strip clean from the mold, and that much heavier castings than it is now possible to make will be poured in moids that have not been subjected to a drying process.

Today instruments measuring the moisture of the sand pile are in daily use, while bond and permeability are checked by constant use of standard equipment. Presently we shall witness means of automatically adjusting the moisture and permeability of the sand as it passes the treating apparatus in the uninterrupted flow of operations.

The evolution of mass production has produced revolutionary changes in the foundry industry. Exacting

demands, previously unheard of and thought impossible, are today met with in contract specifications.

Sees New Market for Malleable Castings

"QUALITY is remembered long after price is forgotten." "Quality" may be a present slogan of American industry. The trouble with the foundry industry is that it is often difficult to find terms in which to make the problem of quality clear to the buyer. This is because of the complexity of the problem, particularly so in the case of cast iron.

In the malleable cast iron field the pioneer work started by Seth Boyden has been continued uninterruptedly, with the result that American black heart malleable now is universally recognized as a very superior product. The untiring research work in this field has developed the air furnace, stoked with pulverized coal as standard practice. While pulverized fuel seems to be ideal for this class of work, it is a pity that so much heat is wasted in the stack. Again, the continuous pouring, such a desirable feature in the modern production foundry, is an impossibility under the present common melting practice. A furnace was built in Germany some time ago, based on the principle of utilizing the waste gases from the air furnace, actually superimposing a cupola on the air furnace. Unfortunately the inventors of this furnace seem to have overlooked the danger of melting with oil, as they did, having the flames playing directly over the hot iron before melting, decomposing the water vapors in the flame and thus oxidizing the metal. It is by no means unlikely that the furnace which will come to stay in the malleable plant will be a continuous melting unit, using pulverized fuel or even carbon monoxide gas.

As to the application of malleable cast iron in engineering construction, changes are evident. While smaller castings in many cases are being displaced by pressed steel or drop forgings, a new market is about to be opened, as the carbon content is gradually being lowered, now at times touching 2 per cent. Such a metal can be poured in the heaviest sections, and while malleable castings now sometimes weigh hundreds of pounds, this tendency to encroach on the field of steel castings may continue. This does not mean that such a tough metal as is demanded in heavy work will be wanted in smaller pieces, where easy machineability is of primary importance.

In the cast iron field, the quality of the available raw materials constitutes a story of constant retrogression. Beginning with the cold blast charcoal furnace, one proceeds to the coke furnace, to hot blast, increased rapidity of ore reduction, and finally a heavy addition of scrap to the blast furnace burden. While the discussion as to scrap in the furnace burden is still blazing hot between producer and consumer of foundry pig iron, the writer may state that he almost universally encountered foundrymen strongly criticizing the unreliable quality of ordinary low-priced virgin metal. One firm purchased 1200 tons of pig iron, but discovered that it was impossible to add more than 10 per cent of this iron to the charge, if trouble were to be avoided. The present situation is no doubt transient.

The greatest difficulty in the case of cast iron is that the price is the most important item—in many cases the only justification for the adoption of this material in constructional parts. The improvement in quality that has to come must be achieved in harmony with the demand for relatively cheap castings. In spite of the extensive metallurgical control common to large American plants, the greatest headway in quality has probably been made in Europe. While the pouring in heated molds, for a while strongly advertised in Germany, may not become practice in America, the all-steel charge in the cupola has been successfully tried in American plants. The study of graphite formation is bound to lead to methods resulting in the most favorable fractures, partly by addition of special alloys, while the amount and form of the combined carbon will be controlled to suit varying demands.

Proposes Electric Forehearth for Cupola

UNFORTUNATELY the cupola is not suited for the production of the highest grades of iron castings. The desirable maximum melting temperatures cannot be attained. A close control of the carbon content is very difficult, and the lower limits at times desired for this element are beyond reach. Again, the sulphur pick-up may be objectionable. Worst of all, the metal is easily oxidized. Hence the resort to air furnace practice or the electric furnace for castings of the highest quality, as for instance in the case of chilled rolls.

Duplexing and even triplexing processes are used. The trouble is that the cost of installing the electric furnace often is prohibitive, and the intermittent application of the electric current is a costly item. The writer recently worked out an idea calling for the combined use of the cupola and an electrically heated stationary forehearth, which—so far as he knows—is new and original.

As shown in the sketch, a self-slagging spout from the cupola is connected with a stationary electrically heated forehearth. The metal is melted as hot as usual in the cupola, runs in a constant stream over the spout, where it gets rid of the acid slags, and enters the basic-lined forehearth, where a basic slag covers the bath. As but a small amount of extra heat need be added, the electric energy may be applied all the time, but a relatively limited amount of current is consumed. The purpose of such a forehearth is threefold: to superheat, to deoxidize and to desulphurize the metal. If small castings are made, the forehearth may be of relatively limited capacity. For large castings the power load will increase, because of the larger cooling surface of the forehearth, the depth of the bath not exceeding 6 in. The metal is tapped when the required quantity of metal has accumulated. The construction details should be such as to allow for the addition of slag-forming materials, also to make it possible to drain the fluid slag at intervals. As alternating current of 110 volts tension is rather common in America, it may, in many cases, be possible to avoid the use of specially constructed melting transformers, although it must be remembered that the application of the current in the furnace at times subjects the transformers to rough treatment.

Should any American foundryman be interested in the above proposition, the writer would appreciate information about the results that may be derived.

Foundries Should Talk the Same Cost Language

THE foundry industry suffers as a result of rapid plant expansion during the war—hence too keen competition, with the natural destructive consequences. While probably all will agree that every order ought to leave a profit, the trouble is that the method of finding production costs has not been standardized. An American association sent a questionnaire to a number of foundries specifying certain castings, giving weights and asking the prices to be paid for all types of labor, for raw materials, etc. All the firms were requested to do was to insert the figures from their respective cost systems. The results showed differences of almost 100 per cent. No wonder the buyer at times is puzzled over the greatly varying quotations! Before real progress can be made, the same language must be talked. The system of cost-finding must be standardized. Presently this problem will be solved through cooperative efforts. "I am perfectly willing to let a competitor see my cost cards—not selling prices. Should I refuse to do so, he is entitled to think that I am not playing fair." This remark—passed by a cost accountant in a steel foundry—will be brought to the attention of foundrymen in Europe.

Over-Expansion in Steel Foundries

Consumption of Castings Has Increased 37 Per Cent Since 1913, But Active Capacity Dropped from 75 to 55 Per Cent During Same Period

BY WILLIAM J. CORBETT*

THERE are 293 individual plants in the United States in which steel castings are manufactured, and these are operated by 267 companies. The total practical capacity for the manufacture of steel castings in the United States is 198,863 net tons of good castings per month, or 2,386,356 net tons (2,130,000 gross tons) of good castings per year. Of this total capacity approximately 9 per cent belongs to companies that manufacture steel castings exclusively for their own use. In addition there are others operating steel foundries all of whose castings are not sold direct to consumers, such companies as those engaged in the manufacture of heavy machinery, and also some of the large steel mills. However, the capacity of foundries operated as separate departments of large corporations is sometimes greater than necessary for their own use, and consequently the surplus is sold in competition with foundries specializing only in the manufacture of steel castings.

Total Sales of Steel Castings Increasing Steadily

The upward trend in the production of steel castings has been quite marked. Users of metal products recognize the strides that have been made in the founding art. The quality of the products made in cast steel has improved, with consequent benefits to their users. While these accomplishments have brought increased recognition of the economy and usefulness of steel castings—and they should be more and more effectual in the future in the way of increasing consumption—the capacity of the industry has never been utilized to its full extent—in fact, the increase in capacity has been greater than the increase in sales.

Fig. 1 is constructed from data (in gross tons) published annually by the American Iron and Steel Institute. No data for the year 1927 are yet available from this source, but it can be estimated, as shown dotted, that the total for last year was below that in 1926. The trend since 1910 is indicated by the straight dotted line, determined in accordance with the customary method of calculating the secular trend of a series of statistical data. The average increase as shown by the straight line of secular trend is about 50 per cent since 1910; that is, one and one-half times as much tonnage of cast steel products was used last year as in 1910. This rate of increase will probably continue for the reasons mentioned above. Yet despite the rapid growth in the consumption of steel castings as depicted in Fig. 1, the capacity of the steel casting industry has increased even more rapidly. Existing facilities have been made more effective, and much new capacity was created during and since the war. If the total production of steel castings in 1927 was 1,320,000 net tons (estimated), only about 55 per cent of the capacity was utilized. Therefore, further increase in steel foundry capacity would be economically unjustified until there is a decided increase in the consumption of the cast steel products.

Acid and Basic Steel on a Par

The trend of production of basic open-hearth steel castings made in foundries has been upward. The output, as indicated by the line of secular trend figured from data of The American Iron and Steel Institute, is about 19 per cent greater at present than in 1910. During the last few years the consumption of open-hearth steel castings, both basic and acid, has been somewhat retarded by the reduced purchases of new railroad equipment, which absorbs a considerable proportion of the total output.

Annual production of steel castings made in foundries using acid open-hearth furnaces are strikingly parallel to those for basic open-hearth castings, and nearly equal in quantity. On the whole, the products of foundries using acid open-hearth furnaces are considered to be general miscellaneous castings, as distinguished from basic open-hearth steel castings which are largely railroad specialty castings.

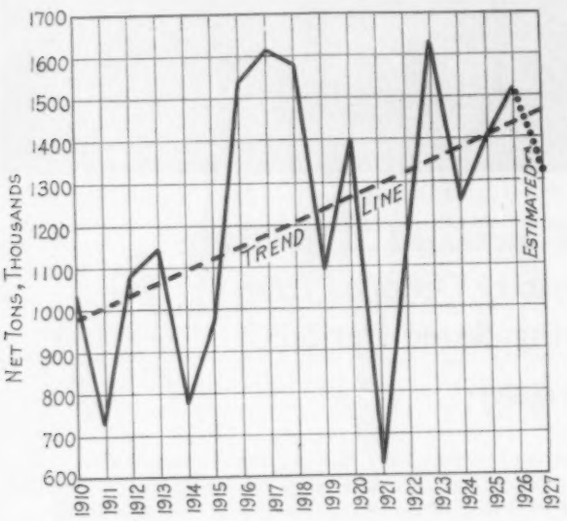
The output of steel castings made by converters, crucibles and electric furnaces consists of small and medium sized carbon and alloy steel castings. These furnaces are chiefly small units and together are responsible for less than one-third of the output in weight. While converter castings had a peak production of 180,000 net tons in 1918, there has been a decrease to 64,000 net tons in 1926. This decline is due entirely to the supplanting of converters by electric furnaces and small open hearth furnaces. Under some

*Secretary-Manager, Steel Founders' Society of America, Pittsburgh.

conditions converters are slightly more costly for making steel, and severe competition compelled the steel foundries to replace them if there was a probability of reducing costs by so doing. This condition has not existed in all converter installations, since it depends on economic factors that vary.

Electric Steel Replacing Converter Steel

A rapid and almost continuous increase in the production of electric steel castings has been common knowledge. In 1914 it amounted to about 10,000 tons; in 1926 it was over 350,000. The most significant increase took place at the beginning of the war when

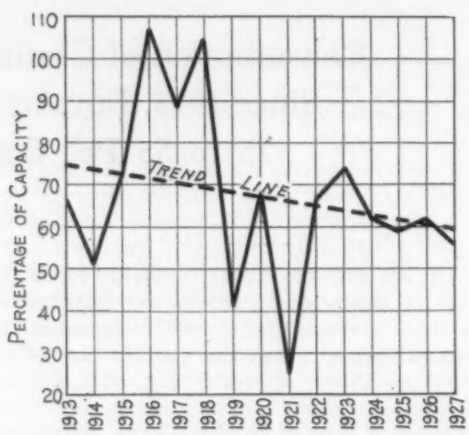


Total Annual Production in Net Tons of Steel Castings in United States. Data from American Iron and Steel Institute, with 1927 estimated

many foundries were prompted to install electric furnaces. Since then the output of foundries operating electric furnaces has more than offset the decline in converter and crucible steel castings. As noted above, the electric furnace has to some extent displaced the converter because, when certain conditions exist in a certain locality at a certain time, the cost of making steel in an electric furnace is less than its cost when the converter is used. However, the important fact must be recognized that the cost of the steel in castings is a relatively small part (approximately 20 per cent) of the total value of the castings and their total cost of production. Therefore, differences in the cost of making steel in different types of furnaces exert only a minor influence on the total cost of manufacturing steel castings.

The rapid increase in electric steel castings has also been due to the fact that products previously made of other materials and assemblies of other materials have been converted into steel castings. Perhaps these new uses for steel castings have had a greater effect in augmenting the output of the smaller castings, such as manufactured in foundries operating electric furnaces, than they have influenced the tonnage of the larger castings manufactured in open hearth furnaces. It is probable that the increase in electric steel castings may not continue at the same rate as would be indicated by the trend lines, unless new uses are created for these castings. The present number of electric furnaces in operation does not justify a further increase in the capacity of this branch of the industry. This is obvious when reference is made to Fig. 2. The condition indicated therein applies to the entire steel casting industry. The rapid increase in number of electric furnaces put into operation is responsible for much of the excess capacity.

The diagram Fig. 2 is of most importance. It shows the relation of the capacity to demand for steel castings. The statistics used were taken from the publications of the Department of Commerce, and the trend as shown by the straight line was computed in the regular way. During the war a great demand for steel castings led to an increase of facilities for producing them, but at no time since the war have these facilities reached more than 74 per cent utilization. Moreover, these production facilities have been increasing since that time, causing the percentage of their utilization to gradually decrease, as shown by the straight dotted line in Fig. 2. This has occurred in spite of the increase in total consumption of steel castings shown in Fig. 1. In 1920 the demand for steel castings was close to 70 per cent of the capacity, and while the trend of consumption has increased 16 per cent since then, the capacity of the industry has grown to such an extent that in 1927 it operated at less than 60 per cent of capacity. During the latter part of last year considerably less than 50 per cent of the capacity of the steel casting industry was utilized.



Total Bookings of Steel Castings in Percentage of Total Capacity. Data from Department of Commerce

It is to be expected that the use of steel castings will continue to increase and perhaps at a greater rate than the rate of increase in population. However, it appears that in the public interest further expansion in the facilities for manufacturing steel castings should be delayed until a greater percentage of the present capacity of the steel foundries can be utilized to meet the needs of consumers.

Suspension of German Mills Would Affect 200,000 Men

HAMBURG, GERMANY, Dec. 20.—The threatened suspension of German steel mills as a result of the controversy over the proper time limit for establishment of an 8-hr. day, should not be very far-reaching. It is rather generally conceded that some compromise settlement will be reached, but should a lockout actually occur, the number of men being laid off should not be more than about 200,000.

As the blast furnaces have the 8-hr. day, there is no intention of suspending operations in this field, unless closing the steel mills forced a general curtailment of production. The threatened suspension also would not affect mills rolling plates, sheets, hoops, bands and pipe and tubes. It would apply to the plants producing steel ingots, semi-finished material, bars and shapes, and the total employed by this branch of the industry is about 200,000.

The controversy of the steel mills with the Government has affected importation, and a considerable tonnage of steel is reported to have been placed by German importers with mills in France, Belgium, Luxemburg and Czechoslovakia.

Changes in Open-Hearth Design and Practice During 1927

BY WILLIAM J. PRIESTLEY*

1927 HAS BEEN notable for an ever-increasing demand for better steel and lower prices. To meet these conditions, steel operators during the past year have analyzed more carefully than ever before the chemistry of their melting practice and sought means to reduce their costs without sacrificing the quality of their steel. Members of the various technical engineering societies have taken an active interest in discussing open-hearth problems.

While there have been no radical changes in open-hearth melting, there has been a liberal exchange of ideas of both operation and furnace design. Ideas and opinions have been wide and varied on every subject discussed, yet it is evident that steel men have come closer in accord on certain of the more important subjects.

It would be improper and impossible to attempt to review in this short article any great number of the topics discussed, but it may be of interest to single out a few of the things in which some degree of progress and development appears to have taken place this past year.

Research in Physics of Steel

A NOTABLE research program was laid out during the past year by the Bureau of Mines, the Carnegie Institute and a number of steel companies cooperating with these two institutions to make a systematic study of the physical chemistry of steel making. The field to be covered is broad and will take at least five years to complete.

During the past year six men under the direction of an advisory board published their findings on the subject of solubility of iron oxide in iron. They propose to take up next the effect of iron oxide and other non-metallics in commercial steel and the means necessary to eliminate these harmful impurities. This group of investigators reported that molten iron is saturated at 1600 deg. C. when it contains 0.30 per cent oxygen, and at 1700 deg. C. when it contains 0.45 per cent oxygen. When applied to practical operations it was pointed out that the iron oxide content of open-hearth slag should be kept as low as possible in order to make the best steel.

Advances in Furnace Design

Pre-Heaters for Air

WITH the view of shortening the time of melting charges, a well known company has presented to open-hearth operators during the past year a device for pre-heating the air before it enters the regenerator, utilizing heat in the waste gas going into the checkers.

The heaters are made with plates of non-oxidizing chrome steel. Steel containing 15 per cent chromium will withstand temperatures up to 1400 deg. Fahr.; steel containing 28 per cent chromium will withstand temperatures as great as 2100 deg. Fahr. without oxidizing. The advocates of this pre-heating device maintain that air entering the furnace from the slag pocket may reach a temperature of 2150 deg. Fahr. instead of 1900. It is said that this higher temperature of the air reduces the melting time from seven hours to six hours. With three hours taken for refining, the total time of making a heat of steel will be nine hours instead of ten. The net gain is 10 per cent and should reduce costs about 25c. per ton of ingot.

During the past year new installations of flat suspended roofs have been reported. The results obtained on the original installations were promising as compared with the commonly used sprung arched roof. Reports have been received of this new type of roof lasting for more than 400 heats.

Advocates of this type of construction think that slight modifications in the height of the roof above the fore plate may produce a faster working furnace and changes in the thickness of the roof tile may give a greater life. They claim 500 heats from a single roof may be possible.

Sloping Back Wall

The sloping back wall was adopted by many furnace men who rebuilt their furnaces during the past year. This feature entirely eliminates back wall repairs and reduces the cost of maintenance. It is nothing more than a continuation of the hearth sloping upward and backward until it reaches the rear skewback of the furnace. The slope of this extended hearth is gentle enough so as to hold the loose dolomite added from time to time for patching. The principal advantage of the sloping back wall is the elimination of the time lost in repairing back walls of brick. This increases the tonnage melted during the life of the furnace.

Isley Furnace

Another innovation pertaining to open-hearth design has received wide discussion during the past year. The Isley furnace utilizes a venturi tube placed vertically at each end of the furnace instead of the stack. There is a low pressure fan at the base of each tube. One fan exhausts the outgoing gases while the other fan running simultaneonsly furnishes a predetermined amount of air to support complete combustion.

The length of the tubes and flues may be varied so as to get the waste gas temperature as low as possible. Cases are recorded where this is as low as 400 deg. Fahr. The flues between the venturi tube and the checkers serve as recuperators and pre-heat the ingoing air on reversal of the furnace.

This type of furnace control is said to save fuel, give greater tonnage and longer life to the furnace.

*Vice-president, Electro Metallurgical Sales Corporation, 30 East Forty-second Street, New York.

Several installations are in operation and more comprehensive data may be published later.

Future Trends in Furnace Design

The future trend of open-hearth design will be toward larger furnaces where greater tonnages will decrease overhead operating expense.

New refractories for furnace lining must be found that will withstand higher melting temperatures and quicker melting.

Ingenuity will have to work out new ways for combining and utilizing to better advantage our present sources of heat.

Furnaces must be constructed to obtain better control over atmospheric conditions for melting and refining. All these developments must come to keep pace with the steady and increasing demand for steel in its many new uses.

Production of Acid Steel

WITH the decreased production of ordnance steel we do not hear as much today about acid steel as we did several years ago. It is for this reason that it might be interesting to review here some of the things that have been said about this type of steel recently.

By far the greatest number of acid open-hearth furnaces in operation are used for making steel castings, but there are still some steel men who prefer acid open-hearth steel to basic open-hearth steel for the peculiar properties obtained for certain products.

Experience of a Cable Maker

This subject was recently brought to the attention of engineers at a discussion of the different kinds of steel used for modern long-span bridges. A well known company that specializes in the manufacture of wire and wire rope, states that after sixty years' experience it still prefers acid steel for suspension bridge cable. This company still believes in purchasing the best selected raw materials for furnace charges. It uses the purest low phosphorus and sulphur pig iron. It uses only its own selected scrap and melts the heat with low-sulphur fuel oil. It claims that acid steel properly made contains fewer non-metallic impurities, has less occluded gases, and has higher tensile strength and elastic limit than best basic steel made in its own plant. It also believes that acid steel has greater resistance to fatigue. No comparison was made between acid open-hearth and basic electric steel of the same composition.

Residual Silicon to Be Avoided

Ideas have changed in regard to the benefits once claimed from the pick up of nascent silicon in acid open-hearth steel. It is generally conceded now that the presence of silicon in this form results in the absorption of gas in the metal, which subsequently makes the steel wild and blowy unless vigorous de-oxidizers are used in the ladle.

Residual silicon and carbon are now reduced to a low point by the use of ore. This creates a boil which agitates the molten steel and liberates gas and particles of slag which had become entrapped in the metal during the melting stage. The bath may be conditioned and finished satisfactorily by the addition of lump 50 per cent ferrosilicon and lump ferromanganese to the furnace. The use of 50 per cent ferrosilicon is more economical and produces a cleaner steel than the former practice of using sand cast silicon pig. No ladle additions of any kind are needed to produce a sound and quiet steel. The time of holding the steel in the ladle depends upon the casting conditions.

Slag Low in Iron Important

While there have been no new developments in acid open-hearth steel practice, more melters have come to realize and appreciate the importance of the slag condition and how it may be used as a guide for determining the quality of their steel.

Well made acid open-hearth steel free from iron oxide will have a slag of light pea green color, correspondingly low in iron oxide. The interior of the cold slag when broken will be solid and free from bubbles.

A black slag indicates the presence of an excessive amount of iron oxide and is a warning that harmful iron oxides have not been eliminated from the steel. Ferroalloys added to metal in this condition and coming in contact with a black slag will be rapidly oxidized and a low recovery will be obtained. Lime added to a black slag will replace the iron oxide it contains and produce a green slag of the description given above.

Because of the equilibrium or balance existing between the slag and molten steel in the acid furnace, the elimination of the iron oxide from the slag will result in the elimination of this same harmful impurity from the steel. The lime is most conveniently added in the form of broken limestone. An example of this phenomenon may be seen by comparing slags to which different amounts of limestone have been added. A typical slag to which 10 lb. of limestone per ton of metal has been added showed

SiO_2	FeO	MnO	CaO
53.96	23.40	11.82	8.72

A slag to which 20 lb. of limestone per ton has been added showed

SiO_2	FeO	MnO	CaO
56.87	7.73	14.50	14.20

The steel from which the latter slag was taken did not require the addition of aluminum to the ladle. It lay quiet in the molds and passed satisfactory physicals.

High-Manganese Pig in Basic Open-Hearth

THE physical and chemical composition of pig iron best suited for basic open-hearth operation has been discussed for many years. While dissenting opinions will always rightfully exist for different practices, it appears to be generally agreed that pig iron with 1.5 to 2 per cent manganese speeds up the furnace and produces better steel than when this element is lower.

Silicon seems to be most desirable between 1 per cent and 1.25 per cent for a cold metal charge and as low as 0.80 per cent for a hot metal charge.

The carbon content has also been discussed, but steel men appear to be as far apart as ever on this subject.

It has been plainly demonstrated in many instances during the past year that alloys of manganese and silicon used together in proper amounts give better results than when used singly or not at all. It has also been shown that clean ferroalloys, free from oxides and impurities, are essential for making clean steel.

Rigid Testing Has Reacted Favorably

TALKING recently with an experienced steel man, he made the statement that while the present multitudinous tests applied to steel by modern metallurgical inspectors are hard on open-hearth melters, they have really been a blessing in disguise. They have resulted in raising the standard of melting practice and better steel is made today than ever before. Open-hearth tonnage operators are sometimes asked for quality which in years gone by would have been furnished by a specialist making high grade acid open-hearth or basic electric steel. Yet there is no doubt that much steel is rejected as the result of improper interpretation of the tests applied. If the inspector had better knowledge of steel melting and the use for which the steel is intended, it would be beneficial to all concerned.

Use of sulphur prints has decreased because they could not always be properly interpreted. Deep etching with different kinds of acids gives a better idea of the nature of the impurities in the metal, but this test may be abused if standardization of acids, temperature and immersion is not followed.

There was a time when micrographs were looked upon by practical steel men as laboratory curiosities, but many grades of forging steel are now sold subject to microscopic tests in both the etched and unetched condition. Deep etching reveals unsoundness and seg-

regation and direction of the flow of metal. The microscope will reveal grain size and will differentiate between iron oxide, silicates and manganese sulphide. Many instances have come to the writer's attention during the past year where photomicrographs have made it possible for melters to improve the quality of their steel by changing open-hearth melting practice.

More Alloy Steel Consumed

WHILE the total steel production in the year 1927 has been below the figures of 1926 and the total amount of alloy steel going into automotive parts in 1927 was less than 1926 on account of curtailed automobile production, the alloy steel tonnage going into other lines of industry has been greater than ever before. Thus the use of alloy steel is becoming more diversified. The trend in modern engineering is to decrease weight and use higher strength materials. This can only be accomplished through the use of alloy steel.

There has been a notable growth in the use of low carbon manganese steel for both rolled products and castings. Steel of this description has been made most satisfactorily in the basic open hearth by the use of low-carbon ferromanganese and silicomanganese.

For locomotive castings where reduced weights and greater ductility are essential, zirconium treated steel has found favor.

Small percentages of chromium are added to steel castings of large sections for the purpose of obtaining closer grain and better physical properties. This practice is growing. Many buyers are again using chrome-vanadium steel after unsuccessful results when using silicomanganese steel as a substitute.

During the past year the amount of low-carbon ferrochrome used in various grades of open-hearth steel has increased 30 per cent. While nearly all stainless steel and rustless iron is made in electric furnaces, satisfactory steel with as high as 25 per cent chromium was made in an acid open hearth. This steel was used for liners and wedge bars for ball mills, jaw plates and toggle seats for jaw crushers, breast plates for rolling mills, rings and pushers for cement mills, rolls for small roll crushers, and valves and valve parts. By de-oxidizing the steel bath and conditioning the slag properly, the ferrochrome, pre-heated red hot, was added to the bath without excessive loss.

Unprofitable Year in Cast Iron Pipe

Centrifugal Output Shows Large Increase, but Total Production Was Probably Under 1926—Price Decline Unusual Feature

ALTHOUGH production of cast iron gas and water pipe in the past year is estimated to have compared favorably with the total output of 1926, possibly showing a slight decrease, the year was rather unprofitable, prices having declined more than 25 per cent. Output of cast iron pipe had been steadily climbing since the war years. In 1921 the total production of gas and water pipe was 564,138 net tons, in 1922 the total was 926,577 tons, in 1923 the million-ton mark was passed with 1,134,059 tons, in 1924 the output was 1,365,272 tons, in 1925 it was 1,414,252 tons, and in 1926, 1,534,278 tons.

A feature of the 1927 production was the growing interest of consumers in centrifugally cast pipe, output of which was larger than in any previous year. The centrifugal pipe shops were operated at a high rate, and competition among the few producers of this product was severe. The total production of pipe made under the De Lavaud and sand spun processes has been estimated at close to 400,000 net tons, the sand spun shops contributing about 25 per cent of this total. This compares with an estimated output of centrifugal pipe in 1926 of 200,000 to 225,000 net tons. Much of this increase is accounted for by the fact that the American Cast Iron Pipe Co., Birmingham, and R. D. Wood & Co., Florence, N. J., have both been active producers, whereas they contributed but little to the total output in 1926.

European pipe was not much of a factor in the East after the first quarter, although both Belgian and French pipe provided fairly active competition on the Pacific Coast for many months. However, the total brought in is estimated at about 80,000 tons, a few thousand tons less than in 1926, when the total for the 12 months was 83,873 gross tons.

The decline of prices, particularly their rapid descent in the latter part of the year, was so great as to attract considerable attention in other branches of the iron and steel industry. From a Birmingham base of about $37 per net ton in January, the market dropped $10 to $11 per ton to about $26 in early October.

This downward movement of prices was not entirely without reaction. In the early spring some firmness developed on the smaller sizes of pipe and there was a slight tendency to advance, but it was of short duration, and as Southern makers began to be more active competitors for large tonnage business in the North, the market began to sag. By the second half of the year efforts to maintain a separate Northern base for pipe proved futile, and the Birmingham base price ruled in sales, not only in the South and at Chicago, but also in the New York and New England markets.

Municipal purchasing of pipe, uusally an important factor, failed to develop to the expected proportions. Buying by privately owned utilities, however, provided the greater part of the year's business in the East. Throughout the year, municipalities on the Pacific Coast were fairly active buyers of small lots, and one of the largest purchasers was Los Angeles, which closed on more than 15,000 tons of pipe, about one-third of which went to French and Belgian sellers. In the second half, the Pacific States Cast Iron Pipe Co., Provo, Utah, organized in 1926, became an active factor in Western business and is estimated to have booked as much as 50 per cent of the late fall orders.

As in 1926, Detroit was the outstanding municipal purchaser of pipe, closing on more than 25,000 tons during the year, part of which went to the importer of French pipe. In the Detroit awards, as in the case of other cities, centrifugally cast pipe represented a larger portion than in the past. New York was also a large buyer of pipe, closing for more than 25,000 tons in all. In the final quarter, several of the large privately owned utilities placed some sizable orders for gas and water pipe covering part of their 1928 requirements.

Expansion of the cast iron pipe industry was not of much consequence. The McWane Cast Iron Pipe Co., Birmingham, has been carrying forward a program of additional equipment and floor space, so that 8-in. to 12-in. pipe up to 16-ft. lengths can be cast as well as the smaller sizes. Early in the year R. D. Wood & Co. began large scale production in their centrifugal shop at Florence, N. J., and in the final quarter began alterations of this shop to increase its capacity.

Machine Tool Problems Working Out

Last Year Gave a Great Revelation of the Productivity and Accuracy of New Machines—What Shall Be Done About Used Tools and the Increase of Unpaid Engineering Service?

BY COL. FRANK A. SCOTT*

TOO erratic was the course of business in the year 1927 to be expressed in a short sentence. Indeed, the year will be notable for the irregularity of business trends. Among machine tool manufacturers and among metal workers generally certain groups have enjoyed a large volume; for example, the automotive industry. Others have had one of the poorest years in their history. Locomotive builders are in the latter class. Profits have been equally erratic and have not always rested in the hands of those concerns which enjoyed the largest volume of orders.

Usually, among the foremost concerns in any field of manufacture profit can be assumed when business reaches a given volume. This rule did not apply in 1927. Unstable price standards are chiefly responsible for this result; and this unsatisfactory price condition is due to the presence in this country of excess facilities in almost every line.

Menace of Excess Facilities

DURING the Napoleonic era England was the great industrial country of Europe and she supplied the world with manufactures of all kinds through that entire struggle. After those wars, however, when the productive power of the rest of the world again came into service, the excess of manufacturing facilities in England menaced her economic life for two decades, and caused severe crises, both industrial and political.

As the United States was the great producer of manufactured goods during the World War, American manufacturers have been the greatest sufferers since from the menace of excess facilities. In the stock market, to unload a weak security and get out at a loss is a common enough operation; but in the manufacturing world it is a sensitive point to suggest liquidation of plants and facilities for which the future holds out the certainty of a falling market. It appears to challenge every one to go out and drum up some new product or fresh opportunity, meanwhile marring the general welfare by marketing goods which are produced at too high a cost and sold on too low a basis.

Because of these excess facilities, prices during 1927 were generally established by the weakest or most desperate members of each group, thus creating a situation wherein many industries bear resemblance to a naval squadron, the best ships of which are held down to the speed of the slowest. The elimination of the slowest would automatically improve the fighting chances of the rest.

Lord Fisher, the great English naval authority, condemned ships too weak to fight and too slow to run away. If he had been analyzing American metal manufacturers he might have voiced similar condemnation against concerns too weak to maintain a profitable price policy and too strong to die with gratifying promptness.

European Production More Effective

EVIDENCE multiplies that other metal-working nations are steadily following the trend in our country toward more productive manufacturing units. The automotive production in England and on the Continent reflects a constant improvement in shop equipment; aircraft production the same. This acceptance of an advanced standard of efficiency in metal working has borne fruit in a steady, although not large, demand for the better grades of American machine tools. Japan has been a good customer, and as a result of a change in the policy of placing orders for Government requirements it appears that India may become at least an occasional buyer of American equipment. Russia placed some orders with American manufacturers and her demands may be expected to increase.

The Ford Factor in 1927

TO the future historian of American manufacturing progress the year 1927 will have a unique interest. In that year occurred the loss of Judge Gary, with all the changes which his going necessitates and implies; also the alteration of Mr. Ford's policy, which very clearly has established new standards that require readjustments, the full consequences of which cannot now be gaged; and last, but certainly not least significant, the presentation to American metal manufacturers by American machine tool producers of a most effective

*President Warner & Swasey Co., Cleveland.

group of metal-working tools. At the very moment when the automotive industry sets itself for a new lap in its long race with costs, there appears to be at hand the stimulus which is most needed; for certainly no industry ever before had offered to it such an opportunity to re-tool its plants efficiently as is now presented to American manufacturers of automobiles.

The action of Mr. Ford, in halting production while he re-tooled his plants for the new car, raised the question as to the adaptability of equipment, first, in his own vast factories, and, second, in the plants of those competitors whose production programs may now require readjustment.

Lessons of the Cleveland Exposition

THE most evident fact at the Cleveland exposition was that the design of the newer machine tools, whether automatic or semi-automatic, aims at flexibility and applicability to the widest possible field of work.

This moves directly against the current of that opinion expressed in recent years that design movement would be toward special machines, even special automatic machines, tooled for particular operations.

It is still too early to claim that the disadvantage of special machines, and particularly special automatic machines in the automotive plants, has been proved. But developments this year indicate that weaknesses of this type of equipment are now recognized even by those who were its strong advocates. The primary advantage of special equipment designed and tooled for a particular operation on one piece needs no comment. If the world could accept the status quo in production, special equipment would hold the stage. The fly in the ointment is that in every competitor's field a change of design by one producer forces similar action upon others, and if highly specialized equipment is being used it proves too inflexible for quick and advantageous readjustment. The expenditure of both time and money is multiplied to perhaps a dangerous degree.

Users Helped in New Development

THERE have been recurring statements, since the war, that machine tool manufacturers were redesigning their products or producing new types of increasingly effective pattern. Not even the leaders of the industry, however, grasped the full effect and meaning of these statements until the doors swung open on the Exposition at Cleveland in September. Then there were seen, many of them for the first time, machine tools of such productivity and accuracy as had never been beheld before. They were the fruitage of sixty years of American mechanical genius, thought and research; sixty years of American workmanship and American aptitude to utilize the best that is available in productive facilities. It did not require the "seeing eye" to recognize the dawn of a new era in metal working.

Users as well as makers of these machines have contributed to their development and are entitled to credit for the splendid result. The greatest acceleration toward improved design came from the automotive industry, intensified by pressure of competition in every field after the war. No other nation has had just the same experience, although England and Germany have felt similar impulses and experienced the same beneficial results in lesser degree.

Thousands of owners and executives of the great metal-working plants of our country, as well as of foreign countries, accepted the opportunity to study this equipment.

The points of origin of the machines on exhibition, as well as the home cities of the visitors, all of whom were registered, emphasized another significant change which has occurred so gradually as almost to escape notice. It is the shift westward of the center of machine tool production and market.

Twenty years ago the market probably would have centered on a line from Buffalo to Pittsburgh; now it undoubtedly would center on a line running south or southwesterly from Detroit. The oil industry in the Southwest has introduced a great number of large and effective machine tools into that section, and there are now many considerable plants producing a wide variety of metal articles in the district north of St. Louis and between the Mississippi River and the Rocky Mountains.

Thousands of Tools in the Discard

REPERCUSSIONS from the Cleveland Exposition were of many sorts. The rise in volume of orders was natural because of those withheld awaiting inspection of machines on exhibition. The psychological effect on the larger machine tool users was impressive. Personal statements and numberless letters written to machine tool producers after the exposition indicate that the thinking in the American metal-working groups is hardening around these conclusions:

The expansion of metal-working plants during the war left a large legacy of excess space and plant equipment. Optimism has sustained the hope that peacetime volume might grow up to these facilities. This has not happened. There are thousands of machine tools in American factories which now are rendered ob-

COLONEL SCOTT'S broad acquaintance with the metal-working industries, which made him chairman of the War Industries Board in 1917, *enables him to speak with unusual authority on the prospects for machine tool builders. He notes that the cost of design, manufacture, sale and servicing of the modern machine tool has risen continuously.*

On account of excess manufacturing capacity dating back to war times, the selling price has been established by the weaker producers; the result is the lowest earnings in several years. In fact, profits are so meager that rising prices for machine tools seem inevitable in 1928.

American manufacturers generally were surprised at the wealth of opportunity displayed to them at the Cleveland Machine Tool Exposition. Low-cost production in many lines, with corresponding effects on the balance sheet, will come to those who first take advantage of the new tools, unrivalled in productivity and accuracy, yet flexible enough to conform to those necessary changes in output found desirable from time to time.

solete by new developments. They never can profitably be employed again. They are scrap. Conservatism or some other restraining influence may retard their disappearance into the cupola, but that is their inevitable destiny, and the sooner they are consigned to it the stronger will be our economic position.

Good Machine Tool Business This Year

IN this frame of mind on the part of manufacturing executives lies the comforting assurance of good machine tool business during 1928. The race for production at lowest cost will be won by the plant which first obtains the advantage of the new facilities.

Over-Extension of Sales Effort and Business Without Profit

TODAY the American metal worker stands far in advance of all his competitors in other lands. He has volume, quality and low production costs. In a general sense, he has 90 per cent of his market right at home among 6 per cent of the world's population — the greatest home market ever known. Now, the problem is, can he profit while he continues to serve? He has developed his sales opportunities to the nth degree in order to secure volume. For the same purpose he has reduced his price until this year many plants that did a good volume will show a meager profit, and in certain lines there have been some notable failures. This does not apply to machine tools only, but as well to many plants in other fields.

There has been enough prosperity to go around most years since the war, but American metal workers have seemed oblivious of this. From the steel makers right through to the small fry they have intensified an already highly competitive situation by over-extension of sales efforts. This cannot continue. Industry can only advance when it is profitable. There is an opportunity here in the American metal-working field for business leadership of a high type. Schooling is needed in the development and maintenance of a code of business ethics which shall include serving the trade well, while maintaining a price level sufficiently high to sustain normal development and yield a profit.

It has been a buyer's market, with such respectable slogans as "long established quality" and "continuity of good service" passing into the discard in favor of temporary advantage in price. It is significant that the American steel industry, the greatest and probably the most efficient of any single industry now existing, should have been a conspicuous sufferer. Quality and the ability to render efficient service are frail holds on the market in any period of intense competition.

There need be no fear, however, that the steel industry and the machine tool industry will meet the fate of the goose that laid the golden egg, even though in performance they do resemble that historic bird. There is a steady movement toward a stronger position. The merging of organizations, the elimination of obsolete and surplus facilities, and a general tightening up on overhead and in sales methods are proceeding. The new year looks like a period of higher prices and better profits even though volume remains as in 1927.

The Used Tool Problem

THERE has been a concerted effort during the year by groups of machine tool manufacturers to devise a workable plan for establishing the value of used tools offered by customers in trade when new tools are purchased. The lack of system in these transactions has been a fruitful source of charges of unethical conduct, annoying to manufacturers, dealers and customers alike. It is the present belief that by establishing a proper and generally accepted method of appraisal a basis can be reached upon which all interested parties may work equitably. The situation, of course, is simpler in the case of manufacturers who sell direct; but even in this field the absence of any recognized standard of values for used tools has provoked questioning and criticism. This will be one step toward a less erratic price policy.

Industries financed by the banks and the public are subjected to automatic check and review as to their price policies and earnings. The machine tool industry, to an unusual degree, is self-contained and does its financing from within. Therefore, it must furnish its own standards and make its own tests of financial success. Dissatisfaction with earnings has been general ever since the war, and reached the peak of expression in 1927.

Engineering Service Increasing, but It Should Be Paid for

THE situation has been strained to the breaking point by the cost of marketing the new designs which have appeared since the war. Every advance in the productivity of the tool has been accompanied by greatly increased cost of engineering services. Engineers to design machine tools have always been necessary. Now, however, high-grade engineering talent is needed to study the customer's particular requirements; to suggest the exact type and size of machine to meet his needs; to lay out his special tools and holding devices, and to demonstrate the machines and instruct operators after installation. As all of these processes except demonstration precede sale, and as none of this cost can possibly be recouped by bidders who do not make the sale, the resultant effect on sales costs is obvious. Even the producer making the sale has thus far been deterred in most instances from adding the full cost of these items to his bid.

That this is not a healthy condition will be admitted without argument; that the solution must necessarily be addition to price of all honest service rendered to the customer must eventually also be admitted. That the machine tool manufacturers are themselves now alive to the dangers of their situation seems equally evident from the tone of all their publications and the addresses at the meeting of the National Machine Tool Builders' Association, held at Lenox, Mass., in October.

A fair volume of business in 1928, therefore, is certain to produce an upward swing of machine tool prices, and the volume now anticipated is more than fair. It is expected to be greater than that of 1927, and perhaps equal to 1926. All the underlying conditions which ordinarily are examined to determine the prospects for the year appear to justify this conclusion. The fact that it is a presidential year has not been overlooked.

General Electric's Pension Plan

The General Electric Co., Schenectady, N. Y., has developed a new contributory pension plan, whereby employees pay in a small part of their wages from year to year to a pension fund. It supplements the old age pension system which the company has had in effect since 1912. At the same time a pension trust has been created, and instead of carrying a reserve on its balance sheet sufficient to meet obligations to employees reaching the retiring age, the company has turned over $5,000,000 to the new trust.

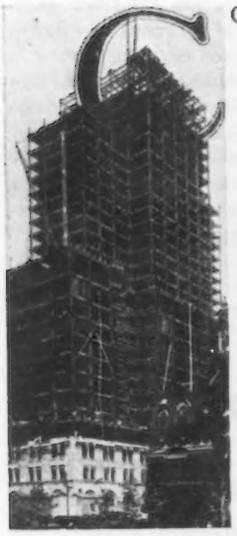
Pensions at present are computed at 1½ per cent of the earnings of employees for each year of continuous service. Under the contributory plan of additional pensions, which it is proposed to make effective Jan. 1, 1929, 1½ per cent of the annual earnings of the employees will be turned over to a board of seven, on which the employees will have representation. This money will be invested and held for the employees individually, and interest will be allowed to accumulate.

Under the new plan it is proposed to make 65 instead of 70 the retiring age for men, and 60, as at present, for women. When an employee reaches the retiring age, the custodians of the fund will pay the accumulated amount in full or in installments. If an employee leaves the service of the company or dies before reaching the pension age, the amount accumulated, with interest, will be given to him or to his estate.

Moderate Building Increase Forecast

Construction Expenditures in 1927 Decreased Less Than 2 Per Cent and Slightly Upward Trend This Year is Indicated, $7,000,000,000 Being Set as Possible Figure

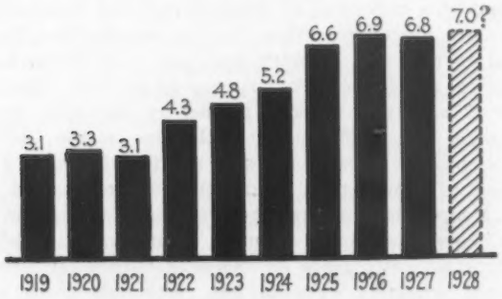
BY THOMAS S. HOLDEN*



CONSTRUCTION is investment. Construction activity measures the rate of flow of investment money into permanent improvements. Productive activities that increase the wealth of the country and accelerate its general prosperity create demands for increased improvements of every kind.

The attached charts should be of interest to the steel business from several points of view. For one thing, they picture the recent history of two industries (the construction industry and the automotive industry) which are among the best customers of the steel industry.

The most rapid growth of the automotive industry came between the years 1921 and 1923, during which production of passenger cars and trucks in the United States and Canada more than doubled. Automobile production increased very moderately between 1923 and 1926 and declined appreciably in 1927. Many economists consider the rapid expansion of the automotive industry, to the extent of doubling its previous output, as having been the chief accelerator of expanding industrial activity in recent years.



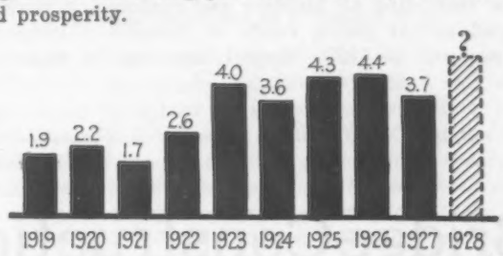
Construction Contracts in Billions of Dollars, Showing Stability From 1925 to Date

Referring to the chart of construction contracts, we see three distinct phases of three years each. The first three years shown on the chart were the years of postwar deflation. The next three years (1922, 1923 and 1924) were the years when building shortage was the dominant factor in construction demand. The third period, which began in 1925, has been a period of stability, with construction activity maintained at a very high level, and with investment considerations predominating in the creation of construction demand.

What Is the Next Stage?

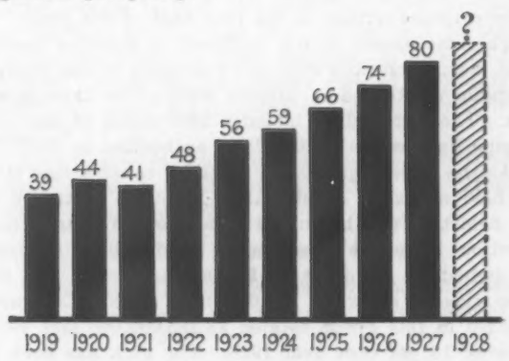
The question now before us is this: What is the next stage of development in the construction industry, decline or further expansion?

Further expansion at a moderate rate would ultimately be demanded by normal population increases and normal increases of commercial, industrial and social activity. Expansion at a more rapid rate might be the result of some influence which would utilize our enormous money and credit resources in a substantial program of increasing productive activity and accelerated prosperity.



Automobile Production in Millions of Cars, Showing Stability From 1923 to 1926, Inclusive, and Decline in 1927

The chart on production of electric energy shows uninterrupted growth from 1921 to the end of 1927. A chart showing the amount of investment money that has been flowing into the electrical industry during recent years would show an even more rapid growth than the one on amounts of energy produced. The writer has previously pointed out elsewhere the various other considerations that point to the electrical industry as being one very likely to expand considerably in the next few years and to give a considerable acceleration to general prosperity.



Electric Energy Produced in Billions of Kilowatt Hours, Showing Uninterrupted Growth From 1921

This would accelerate expanding construction activity. It would involve directly a large volume of construction of dams, power plants, transmission lines, and other work pertaining to electrical growth. Indirectly, if expansion of the electrical industry develops to such an extent as to stimulate a new era of industrial growth and increased prosperity it will create new demands for better buildings of every class—houses, apartments, factories, office buildings, schools and churches, and for community developments, consisting of both building and engineering projects, that make living more agreeable for a wealthy, prosperous people.

If this be true, then it looks as if 1928 might be

*Vice-president, in charge of Statistical Division, F. W. Dodge Corporation.

a year of transition between the recent period of stabilized construction volume and the next period of expanding activity. This new year may not see large increases in construction activity, but it may very well see moderate increases, in preparation for more extensive increases later.

Total construction expenditures in 1927 decreased less than 2 per cent from 1926. Yet a very real recession in private construction work has been going on ever since the end of 1925. Private construction expenditures decreased 6 per cent from the previous year in 1927. This recession apparently came to a halt several months ago, since which time there has been moderate improvement in the rate of contract-letting for private construction work. Records of domestic corporate bond issues (omitting refunding issues) are the best advance indicators of the trends of contract-letting for private construction. Recent increases in this class of investment funds indicate increased contract-letting. Expenditures for community construction work (including all building and engineering work financed out of public funds or donations) increased 10 per cent in 1927. Recent increases in municipal bond issues indicate that this big general class of work ought to continue through 1928 in a volume at least as great as in 1927.

Moderate Increase Over 1927 Expected

In the chart, $7,000,000,000 is set as the writer's estimate of total construction expenditures this year. It is a moderate increase over 1927, but just a little bigger than any previous year.

Various spokesmen for the automotive industry promise a record year in 1928. Increased automobile production ought to add confidence to business generally and to encourage any business men who might be hesitating about making construction contract commitments. Increased agricultural purchasing power should be an added help to increased construction.

Any stimulus to general business expansion and largely increased construction activity that may come from further growth of the electrical industry is rather likely to be felt in full force after 1928. Economically and financially, the country seems ready for such a program as sketched above, but political considerations, as yet uncharted, may be uppermost this year.

Bridge Construction Gained 70 Per Cent

Total for All Classes of Work Exceeded $7,000,000,000 as It Did in 1926—Outlook for 1928 Is for Continuance of High Rate of Building

BY ALDEN W. WELCH*

THE value of construction contracts awarded in 1927 exceeded $7,000,000,000, as did that of 1926. The industry's record years began with 1922, and there is no visible reason to believe that they have ended with 1927. In fact, the latter half of last year showed greater activity than the first half, giving a momentum that is carrying into 1928 the assurance of continued lively contract-letting in the first half of the year.

This movement is not confined to building operations, but is reflected even more actively in the domain of public works and in private work other than buildings. The latter class includes 5000 miles of gas and oil pipe lines worth $120,000,000 authorized in 1927.

As the major demand for steel for construction is in the field of heavy construction, it is the statistics of this field that will be quoted hereafter. By heavy construction is meant commercial buildings of $150,000 and industrial buildings of $40,000 and more, and for other classes of work $25,000 and more. Contracts awarded in this group totaled $3,225,000,000 last year, a rise of 13 per cent over 1926. The gain has been in every class except waterworks, where contracts fell off 14 per cent in aggregate value. The greatest gain was in bridges—70 per cent. This is easily explained by the unusually large number of outstanding bridge projects placed under contract last year. Six of these —the two over Arthur Kill, between New Jersey and Staten Island; the one between New York City and Fort Lee, N. J.; the mid-Hudson at Poughkeepsie; the Lehigh Valley Railroad over Newark Bay, N. J., and the Delaware, Lackawanna & Western over the Hackensack River—total $45,000,000. Even in road work, the steadiest of all classes, there has been a gain in volume. And returning to buildings, contracts for heavy structures total $1,700,000,000, a gain of 9 per cent.

Can the pace be maintained in 1928? There is no information in the construction industry itself to indicate that it cannot or will not be. Construction activity is largely a reflection of general business prosperity. There are, therefore, certain factors broader than those found in any one industry that can slow down construction, not to mention business in general. One of these is narrowed markets caused by European competition. The tariff may hold the line in the United States, but the foreign markets are free for all. The relation of construction to exports was emphasized by E. J. Mehren in his address before the New York Building Congress on Oct. 5, when he pointed out that high construction costs place an overhead burden on manufactured products. Fortunately, although costs are double those prior to 1915, the trend is down and has been throughout 1927.

Coincident with the rapid increase in construction volume there has naturally been a strong increase in credits. Should credit give out, deflation would begin. This, however, is a broad business factor and does not reside in the construction industry. The industry is ready and able to carry on, and expects to keep busy in 1928.

*Manager Business News Department, McGraw-Hill Publishing Co., New York.

Nineteen twenty-seven was only a fair year in the electrical industry, according to E. M. Herr, president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. While the volume of business has been reasonably well maintained, the cold spring and early summer greatly reduced the volume of fan motor business—an important line in the industry—and the intense competition in all lines has held prices on much of the product below normal, resulting in reduced profits to the manufacturer. During the past year, however, increased sales of all domestic appliances, with the exception of fan motors, have been shown throughout the country.

Better Automotive Outlook for 1928

Predictions Freely Made by Leaders of the Industry That Car and Truck Output This Year Will Total 4,400,000 to 5,000,000 Units—Ford Production Will Be Factor

BY NORMAN G. SHIDLE*

SALES volume in the automotive industry probably will be 15 to 20 per cent greater in 1928 than in 1927. Replacement parts makers, accessory manufacturers, and repair shop equipment companies, as well as car and truck factories, expect definitely increased activity during the next 12 months.

The final announcement of the new Ford model A of course is the largest single factor lending strength to predictions of marked advance in automotive volume. When Ford gets into quantity production, not only will passenger car output figures be increased materially, but the business of numerous companies making replacement parts and accessories designed to go on the Ford will be given a marked impetus as compared with the last half of 1927. And, despite the great relative increase in original equipment items on the model A as compared with the model T, there are many items which will be added through retail channels.

1928 Output May Reach 4,400,000 Units

Aside from Ford's unquestioned effect on the total vehicle production figures of the industry, the story of 1928 automotive prospects is far from revolving entirely around Ford. There is good reason to believe that the automotive industry in 1928 will build as many as 3,900,000 passenger cars and 500,000 motor trucks, and that Ford will not be entirely responsible for the increase. In considering Ford's probable contribution to the 1928 total, account must be taken of the possibility that he will not be able to get into full production as soon as expected.

The total output of passenger cars, exclusive of Fords, was nearly the same in 1927 as in 1926, although some very wide individual variations were recorded. There will be still further individual variations this year, but many of these doubtless will balance one another as they did in 1927. It is quite likely that producers in 1928, exclusive of Ford, will build at least as many and very probably quite a few more vehicles than in 1927.

Opinion in the industry, among vehicle manufacturers, parts makers, and dealers, leans strongly to the belief that 1928 automotive business will eclipse not only that of 1927 but that of the record year 1926, when 3,929,542 passenger cars and 535,006 motor trucks were built. To justify this trend of opinion, it is pointed out that 1927 in passenger car output fell below even the "off" year of 1924.

Some Predictions of a Record Year

While so important a figure as John J. Raskob has predicted a production of 5,000,000 in 1928 and while his opinion is upheld by several representative automotive men, it is the more common belief that the 1928 total will not reach such high proportions. Communications and talks with a number of important vehicle company executives indicate a rather general idea that the 1928 figure will be around 4,500,000 with a few voicing their belief in a more conservative figure.

The general opinion among parts and equipment manufacturers seems to be that 1928 will be an excellent year but that competition will be very keen, with individual efficiency and merchandising the outstanding elements in determining success.

The president of one unit parts company, for example, thinks "that competition in 1928 will be keener than in 1927, when, of course, it was very keen. This element would obviously tend to reduce profits, not only of car manufacturers but also of parts manufacturers." An accessory company executive, on the other hand, writes his belief that "car sales, car manufacturers' profits and the profits of component parts makers should all be more favorable in 1928 than in 1927. The fundamental reason is that the country is prosperous and has not been buying cars at a normal rate because of the hesitancy due to style changes, principally those of Ford. With the atmosphere cleared, following the New York show, the industry will spurt to record volume."

It is interesting that few automotive executives are bothering much about the fact that a new President will be elected in 1928.

Used Car Situation an Obstacle

The advent of the new Ford will not improve the used car situation in the opinion of most observers, as

*Directing editor, *Automotive Industries*.

the dammed up demand for the new model will release to the used car market an unusually large number of cheap cars in the first half of 1928.

Offsetting any tendency toward limiting production which the used car situation might produce is the constantly increasing activity in automotive export markets. Last year was featured by distinct gains in overseas' sales of both vehicles and parts, even while the domestic market was sagging a bit. In the first 10 months of 1927 American automotive manufacturers sold to foreign markets about $70,000,000 worth of goods in excess of the amount sold in those same markets in the first 10 months of 1926. The total export business in cars, trucks and parts—exclusive of tires and shop equipment in which increases also have been recorded—for the first 10 months of 1927 alone reached nearly $350,000,000, to which several millions more will be added when the final returns for 12 months are accumulated.

Progress in the Foreign Field

Every automotive line has continued to make progress in the foreign field. Exports of passenger cars from the United States and Canada increased from 238,376 for 10 months of 1926 to 276,200 for the first 10 months of 1927. For the same periods truck exports went up from 61,244 to 102,880 and parts exports increased from $76,368,993 in 1926 to $88,583,362. There is every evidence that continued stabilization of world affairs will result in still further advances in export sales in 1928.

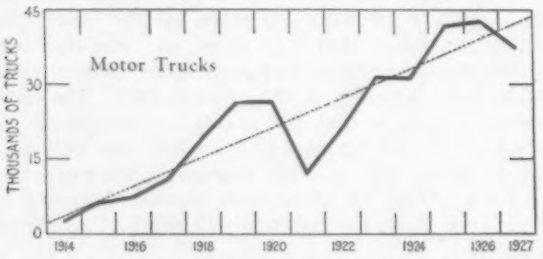
To estimate just how much plant expansion there may be in the automotive industry next year is difficult. It is certain that there will be many plants revamped, many new machinery layouts made and much new equipment purchased. The period of competition in which the parts makers, as well as the vehicle makers, find themselves is sure to result in even more intensive investigation of ways and means of cutting production costs, in study of the latest methods of doing old operations and in continued revision of factories and plants to meet changing requirements.

Selling prices seem almost certain to remain reasonably stable throughout the 1928 spring selling season. This in itself will be a big factor in keeping the industry on an even keel and in making 1928 a prosperous as well as a productive year. Some are of the opinion that there is a possibility of a slightly downward trend in prices in the lower price classes due to the new values to be found in the model A Fords at little more than the price of the model T.

There has been a growing feeling in the industry that price is no longer as powerful a sales weapon as it once was; very strong efforts to focus sales appeal on other factors have been taking effect. Consequently there is every reason to believe that no serious price readjustments are going to be made in the industry as a whole.

Automobiles and Motor Trucks Declined Greatly from 1926 High Records

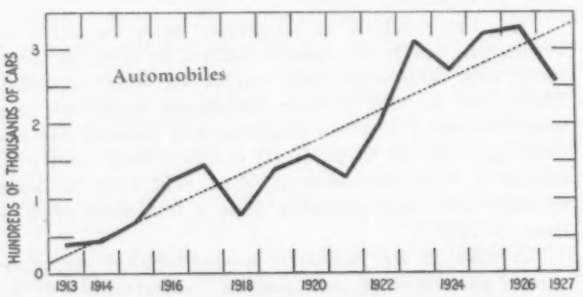
BASED on an estimate of 100,000 vehicles in December, production of automobiles and motor trucks in the United States in 1927 aggregated about 3,350,000.



Motor Truck Production, Which Includes Buses, Has Kept Up Better Than That of Passenger Automobiles. The dotted line shows the long-time trend, mathematically determined. This last year has fallen a little below it. Figures are monthly averages

This is a drop of 22 per cent from the 4,298,785 vehicles reported by the Department of Commerce for 1926. The figures do not include Canadian production. The output for 1927 was the lowest since 1922. It compares with 4,174,886 in 1925, with 3,505,624 in 1924 and with 3,951,014 in 1923.

Passenger automobiles made in 1927 in the United States, with December estimated at about 80,000, aggregated approximately 2,910,000. Trucks, with December estimated at 20,000, amounted to 447,000. The passenger car total showed a drop of nearly 24 per cent from the 3,808,753 of 1926, and made the lowest total since 1922. Trucks showed a drop of only 9 per cent and, with the exception of 1926 and 1925, made the largest total on record.



Automobile Production Fell Below 1924 in 1927, as Shown by the Monthly Averages in the Diagram. The dotted line is the long-time trend

PRODUCTION OF AUTOMOBILES IN THE UNITED STATES

	1927		1926	
	Passenger Cars	Trucks	Passenger Cars	Trucks
January	199,650	39,276	277,831	31,713
February	264,171	40,582	325,122	39,057
March	345,911	48,506	387,570	46,897
April	357,009	47,728	389,833	51,473
May	357,148	46,949	375,317	45,862
June	278,728	43,218	343,708	44,192
July	236,866	31,603	319,688	39,587
August	274,350	34,432	382,651	43,954
September	226,440	33,938	352,202	43,485
October	182,941	36,669	292,562	41,859
November	108,903	24,299	222,419	33,881
December	80,000(a)	20,000(a)	139,850	28,072
Total	2,910,000(a)	447,000(a)	3,808,753	490,032

(a) December estimated.

Figures for cars and trucks separately through the first 11 months of 1927, with estimates for December and with comparisons for 1926, are given in the table.

Both trucks and passenger cars fell below their calculated "normal trend lines" in 1927. The two charts are by no means parallel, however. The well-remembered spurt in trucks in 1917 and 1918, and curtailment of "pleasure" cars, show up clearly. Whether the year 1927 would have shown a drop in either type, but for the Ford changes, is a disputed question.

Much Steel Used in Oil Fields

Less Drilling Done Last Year, but More Line Pipe and Storage Tanks Built—The 1928 Tonnage Expected to Be Approximately as Great

BY VIRGIL B. GUTHRIE*

A TREMENDOUS volume of steel tonnage was absorbed by the oil industry in 1927. Probably it amounted to almost as much as in 1926, despite curtailing of active operations in many producing fields in the country due to the overproduction of crude. To offset this decline in activity generally, there was highly intensive work in such districts as the Seminole field, Okla., in some of the California oil fields and in several new districts in Texas. Texas will probably be the most active State in development work in 1928.

The entire oil industry put about 65,000,000 barrels of crude into storage in 1927, whereas in 1926 it withdrew from its stock about 22,000,000 barrels. This volume going into storage in 1927 was for the most part in the new areas of flush production, and new steel storage had to be built to take care of it. The amount of steel used in plates in constructing big field tanks, 55,000 and 80,000 barrels capacity, was more than the 175,000 tons used for such purposes in 1926.

Drilling Wells

Wells drilled during 1927, either as oil wells, gas wells or dry holes, totaled about 23,000 and called for tonnages of pipe according to the following estimates:

District	No. Holes	Aver. Depth	Tons Each	Approx. Total	Change from 1926
Eastern States	6,500	2,000	30	195,000	5,000 less
Oklahoma	4,600	3,000	90	415,000	35,000 less
Kansas	1,370	3,000	111	150,000	50,000 less
Texas .....7,000 to	8,000	2,500	33	260,000	50,000 more
Louisiana-Arkansas	1,200	2,500	35	40,000	15,000 less
Rocky Mountains..	1,100	3,500	140	150,000	60,000 more
California	950	4,000	115	110,000	10,000 more

The total of pipe going into drilling wells during 1927 was therefore probably around 1,250,000 tons, which is below the total for 1926. Intensive developments in a few districts went far to offset slackening operations in many fields during the summer and fall.

It is probable that the decline in field work which has become more noticeable in the oil producing industry the last half of 1927 will continue during the early part of 1928. There are no signs as yet of a coming demand for crude which cannot be met, and more, by the fields now developed or in process of development.

Field Storages

Due to over-production in flush fields of Oklahoma and Texas and consequent storage of crude, the tonnage of steel going into storage tanks was larger in 1927 than the year preceding. Some 285,000 tons of material went into this service in Oklahoma, Texas and California, the three most active States during 1927. This figure was augmented by that tonnage going into small lease tanks, which is impossible to estimate. The total may be nearly double that bought in 1926 for similar purposes.

In Oklahoma it is estimated 21,000,000 barrels of crude storage were built in 1927, calling for around 84,000 tons of steel. Of this amount, 76,000 tons went into storage tanks in the Seminole field.

California put 10,000,000 barrels of crude into new steel storage in 1927, using 40,000 tons of steel plates.

Texas put 35,000,000 of crude into new storage at tank farms and some 5,000,000 barrels into new storage at refineries, calling for about 160,000 tons of plates for this purpose.

For 1928, it is not considered likely that nearly the amount of steel storage put up in 1927 will be built in Oklahoma, and probably not in California. Texas, however, with several new fields likely to be developed further in 1928, may overbalance the loss.

Pipe Lines

So many thousand tons of steel pipe were bought for oil and gas transport that this became the backbone of the tubular goods market. An editorial survey, published in THE IRON AGE for Dec. 22, 1927, places the tonnage required for notable projects contracted for at 300,000 tons in 1926, 575,000 tons in 1927, and 700,000 tons in prospect for 1928. Not all of the work started in 1927 was completed by the turn of the year, but at least 400,000 tons of pipe was put into trunk lines in Oklahoma, Texas and Kansas alone.

Oklahoma built 600 miles of 4-in. line, 350 miles of 6-in. line, 450 miles of 8-in. line and 150 miles of 10-in. line, these altogether requiring 64,000 tons of pipe. In addition to the usual amount of shorter lines, a 100-mile stretch of 6-in. pipe was built in California—altogether buying about 10,000 tons for these purposes. Texas had the biggest pipe line construction program, its new fields being at considerable distance from existing trunk lines, refineries, or tide water. Furthermore, some companies were compelled to increase the carrying capacity of their pipe line systems running from the Mid-continent fields through Texas to the Gulf refineries. Another company built the first division of what will be a transcontinental system of oil lines. Such activity amounted in round numbers to 1950 miles of 8-in. and 500 miles of 10-in. line. Add to this about 300 miles of gas pipe of 20-in. diameter, and the total laid in Texas consumed over 300,000 tons of steel.

Work is now starting on 200 miles of 10-in. line in Oklahoma. In Texas there is building 250 miles of 8-in. and 800 miles of 10-in. line as the year opens. Many projects are under way which will entail considerable pipe line construction in 1928, not only of oil lines, but also larger gas lines.

In Other Branches

Aside from this consumption of steel in the producing end of the oil industry—by far the greatest of any branch—the marketing branch of the industry became a good outlet for plates for small storage tanks in 1927. It is impossible to estimate the tonnage going into this use.

Refineries are demanding an increasing amount of special steel products capable of resisting high degrees of pressures and heat, and the corrosive effects of sulphur-bearing crudes. In tonnages this would not amount to any large figure, of course, but it will be a marked influence on the production of special steels.

*Managing editor, *National Petroleum News*, Cleveland.

Better Prospects for Steel Jobbers

Moves Made by Producers to Divert Small-Lot Business to Warehouses Point to More Stable Market Conditions

BY GEORGE F. TEGAN*

STEEL jobbers look forward to the future more hopefully than at any time in the past five or six years. Although 1927 was discouraging from the standpoint of business volume and satisfactory returns, more definite progress was made in the direction of an adjustment of the respective fields of the mills and warehouses than in the previous five years combined. The mills have learned that in many instances it costs much more to take orders of warehouse size than the results warrant in either profit or good will, and in some lines they have set up charges on small-lot orders commensurate with the extra costs of handling and assembling. The purpose of these changes is to divert small-lot business back to the warehouses.

Prior to and during the war, steel merchants obtained 80 per cent of their profits, it is estimated, on business that could not be handled by the mills. Then, as a result of war-expanded productive capacity and better railroad service, out of which grew short-range buying and "zero" inventories, there came a period when there was almost no order so small that the mills would refuse it.

This was not the only way that the steel merchant was hit. One of the accompanying developments of short-range buying was a marked narrowing in the range of price fluctuations. The jobber who formerly operated on the theory that success in steel merchandising lay far more in buying right than in selling, found it impossible to buy heavily when prices appeared low and hold for an advance. The general drift of steel prices in the past five years has been downward and chances for speculative profits have been small.

The merchant has long performed a useful function, and there are few who will dispute that he will continue to do so, but conditions have so changed in recent years that this function in the future is likely to be more definitely of a complementary character, offering service that can be less economically supplied by the steel producer. The mills still will take small-lot business and can handle such business, but plainly the steps they have taken in the past year have been toward a greater diversion of such business to those better equipped to handle it.

The first step in the bridging of the difficulties between mill and merchant was taken last March, when the makers of bolts and nuts announced a new price list and a common discount to apply on large lots. This new mode of selling also provided that for broken cases the charge would be 10 per cent more than for full cases of a size. Many jobbers protested this extra charge on the score that, in order to avoid it, they would have to stock large quantities of slow-moving sizes and styles, but what they seemingly overlooked was the fact that, by making this charge for broken cases, the manufacturers were by that act divesting themselves of a kind of business that they had found extremely unprofitable and turning it over to the jobber. The warehouse was not expected to do business for less, but rather to name resale prices that would put the cost of small-lot purchases where it belonged—upon the buyer who bought in retail, instead of wholesale, quantities. Bolt and nut manufacturers went even further; to the habitually small customer they had acquired when no order was too small for them to handle, they began quoting an even higher price than the small-lot buyer could get from the jobber or merchant.

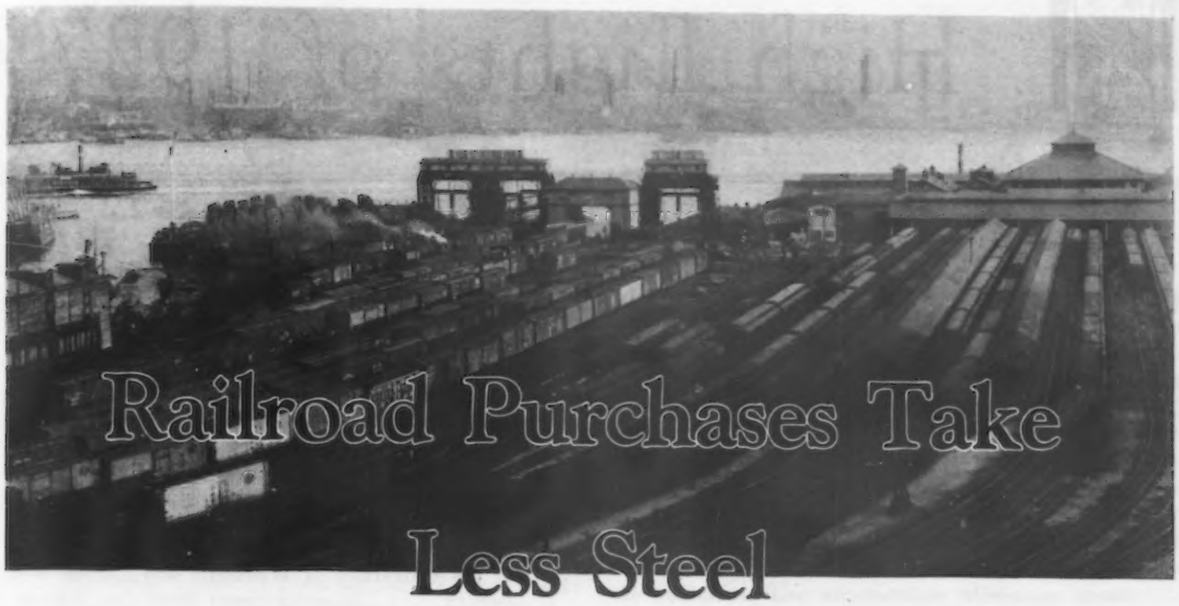
The bolt and nut prices and discount were not formulated over night, but, on the contrary, represented at least two years of intensive study, not only of producing costs, but costs of assembling, packing and shipping. One large manufacturer found that in packing alone there was a cost of $9 a ton, which had to be absorbed under the old schedule. Never before has there been a better stabilized market in these lines than in the past nine months, or a time when the merchant was able to handle them more satisfactorily.

The next effort of a similar character came last October, when the jobber was plainly recognized in a card of extras on cold-finished steel bars and shafting, distribution of which is very heavy through the warehouses. Until that time, manufacturers imposed no quantity charge for lots as small as 1 ton; when the quantity was 1999 to 1000 lb., the charge was 20c. per 100 lb., and for less than 1000 lb., 50c. per 100 lb. In the new card, which came out under date of Oct. 17, 1927, later modified to conform with a new card of extras on hot-rolled bars, the following quantity differentials were imposed: 20c. per 100 lb. for lots of less than 2 tons down to 1 ton, 40c., for lots of 1999 lb. to 1000 lb.; 75c. for lots of 999 lb. to 500 lb., and $1 per 100 lb. for lots of less than 500 lb. What could be more palpably an effort to turn the small-lot orders to the jobbers than the imposition of these quantity charges?

Encouragement to the jobbers was also given in the new card of wire nail extras announced and effective as of Dec. 1, 1927. There are no longer any base sizes of nails, i.e. sizes that sell at the base price, but the jobber who can now place a carload order, whether entirely made up of nails or mixed with other products, gets a concession of 10 per cent under the revised card.

The principal change in a new card of extras on hot-rolled bars and small shapes is in the quantity differentials, which are raised to a point where the small-lot buyer can do as well with his local jobber as by going direct to the mill. When the quantity is less than 4000 lb., but not less than 2000 lb., there is a lump sum charge for assembling and handling of $3. When the lot is less than 2000 lb., but not less than 1000 lb., the charge is $6, and for lots of less than 1000 lb. $10 is added to the net price of the lot.

*Resident editor THE IRON AGE at Pittsburgh.



Railroad Purchases Take Less Steel

Cars Ordered Show a Slight Gain Over 1926, but the Number of Those Built Was Smallest Since 1921—Capital Expenditures of Class I Roads Fell Off 15 Per Cent

THE amount of steel taken by the railroads of the United States in 1927 was considerably less than was consumed in 1926, not excepting rails. This applies to direct purchases by the roads as well as purchases by companies engaged in the building of railroad equipment.

Capital expenditures of the Class I roads for the year were approximately $750,000,000, a decrease of $135,000,000 or 15 per cent from the 1926 record, as estimated by the American Railway Association.

Actual capital expenditures since 1920 follow:

1920	$653,267,000	1924	$874,743,000
1921	557,035,000	1925	748,191,000
1922	429,273,000	1926	885,086,000
1923	1,059,149,000	1927	750,000,000*

*Estimated.

Equipment Expenditures Below 1926

Expenditures in 1927 for equipment, which includes cars and locomotives, amounted to $270,000,000 compared with $380,000,000 in 1926. The outlay for roadway and structures, additional track, heavier rails, additional ballast, shops and engine houses, including machinery and tools, amounted to $480,000,000 compared with $495,000,000 in 1926.

Due to the purchase of upward of 12,000 cars in in the last two weeks of the year, the total number of freight cars ordered in 1927 ran ahead of the 1926 total by nearly 5000. *Railway Age* computes the total of cars ordered for service in the United States as 71,606 compared with 67,000 in the preceding year. In addition there were 2133 cars ordered for service in Canada and 646 for export to other countries. The total of locomotives ordered was 808, including 58 for Canada and 54 for other countries.

Orders Received by Car Builders

The above figures include equipment authorized for construction in railroad companies' own shops. Orders received by the independent car builders, also deliveries, are shown in the following table, but are only for 11 months:

CARS DELIVERED

	Domestic	
	November	Jan. 1 to Nov. 30
Freight train cars	3,754	52,294
Passenger train cars	164	1,254
Interurban, subway and other heavy elec. cars	53	536
Self propelled cars	11	43
Street railway cars	57	442
Freight car repairs	124	5,947

CARS ORDERED

	Domestic	
	November	Jan. 1 to Nov. 30
Freight train cars	1,378	46,246
Passenger train cars	0	1,164
Interurban, subway and other heavy elec. cars	120	226
Self propelled cars	34	115
Street railway cars	25	490
Freight car repairs	50	5,110

The number of freight cars built and delivered in 1927 was the lowest since 1921. The total for domestic use, as estimated by *Railway Age*, was 63,390, while the figures for preceding years are as follows:

1919	82,845	1923	145,083
1920	46,784	1924	104,093
1921	39,259	1925	94,907
1922	63,866	1926	78,870

Railroads built 779 miles of new main line in 1927, but 202 miles of track were abandoned and taken up, leaving a net increase of trackage of 577 miles.

EQUIPMENT ORDERED IN UNITED STATES AND CANADA

(Compiled by *Railway Age*)

	Locomotives	Freight Cars	Passenger Cars
For service in United States	696	71,606	1,612
For service in Canada	58	2,133	143
For service in other countries	54	646	48
Total	808	74,385	1,803

EQUIPMENT BUILT*

	Locomotives	Freight Cars	Passenger Cars
Domestic	958	63,390	1,785
Canada	51	2,851	126
Export	167	1,087	50
Total	1,176	67,328	1,961

*Includes builders and railroad company shops.

High Lights of 1927—

January

PRODUCTION of 47,000,000 tons of steel ingots in 1926 exceeds previous record by nearly 3,000,000 tons . . . Manufacture of 3,750,000 passenger cars and nearly 500,000 trucks in 1926 establishes new automotive production record . . . . Comprehensive survey looking to the setting up of national and international standards for industry is announced by Secretary Hoover . . . . Bill providing for medals of honor and monetary awards for scientists in Government work is introduced into Congress . . . . Heat recovery, reduced equipment maintenance and production of better coke are purposes of dry-quenching process installed at Rochester, N. Y. . . . . Treasury Department issues anti-dumping order on pig iron from Germany; at same time rolled steel imported from Germany is declared not subject to countervailing duties.

February

NEW scrap classifications, embracing important changes in No. 2 heavy melting steel and in various grades of blast furnace scrap, are announced by Bethlehem Steel Co. . . . . Exports of machinery exceed $400,000,000 in 1926, a gain of $15,000,000 over previous year . . . . Accidents in iron and steel industry over 1910-1925 period declined 62.1 per cent in frequency and 51.9 per cent in severity, according to data issued by Bureau of Labor Statistics . . . . George W. Prentiss & Co. observe seventieth anniversary as manufacturer of wire at Worcester, Mass. . . . . Duty on pig iron is increased 50 per cent (to $1.12½) on request of Eastern merchant producers. . . . American Rolling Mill Co. announces purchase of Norton Iron Works and Ashland Steel Co. as part of extension program at Ashland, Ky.

March

ANNOUNCEMENT of new list prices on bolts and nuts brings sweeping revision to conform to present manufacturing costs and to permit single discount . . . . Companies producing 75 per cent of rolled and finished steel earned 7.37 per cent on investment in 1926 as compared with 5.93 per cent in 1925 . . . . Intermediate grade of American Society for Testing Materials is adopted as single standard for billet stock reinforcing steel . . . . General investigation of freight rates on iron and steel products in Official Classification territory is opened by Interstate Commerce Commission at Pittsburgh . . . . Standardized spindle end for milling machines is adopted by manufacturers' group of National Machine Tool Builders Association.

April

UNION miners of bituminous coal in western Pennsylvania, Ohio, Indiana and Illinois go out on strike. . . . Daily rate of steel ingot production in March, at 168,867 tons, sets new high record. . . . . Yearly pig iron production per furnace in Pittsburgh district has increased more than 50 per cent in last 24 years, survey shows . . . . Production of 3,200,000 tons of steel rails in 1926 largest since 1913 . . . . To advance standards of technical education, 150 engineering colleges unite to establish summer schools for training of teachers at the University of Wisconsin and Cornell University . . . . Superior Sheet Steel Co., Kokomo Steel & Wire Co. and Chapman-Price Steel Co. are consolidated as Continental Steel Corporation and plan ultimate ingot capacity of 250,000 tons annually . . . . Silver anniversary meeting of American Electrochemical Society is held at Philadelphia . . . . Robesonia furnace property in Pennsylvania, on which pig iron has been made almost continuously since 1793, is sold to Bethlehem Steel Co. and furnace will be dismantled . . . . Setting up of distance scales for iron and steel freight rates in Southwest by Interstate Commerce Commission brings about far-reaching changes in relationships.

May

STEEL ingots weighing 63,000 lb., converted into slabs on 206-in. plate mill of Lukens Steel Co., are believed to have set new record. . . . Hot-rolled and cold-rolled strip institutes are formed by country's leading producers with scientific rather than trade functions as their purpose . . . . United States Steel Corporation establishes department of research and technology, to be directed by Dr. John Johnston, late of Yale University . . . . Continuous rolling of sheets is begun at plant of Columbia Steel Co., Butler, Pa. . . . . Railroads adopt recommendations of Department of Commerce to revise and coordinate scrap classifications for sake of uniformity.

June

ROLLING of sheet steel from ingot to finished product in continuous process begins at new American Rolling Mill Co. plant at Ashland, Ky. . . . . New England mills and railroads ask for special consideration in concluding session of general inquiry into iron and steel freight rates held by Interstate Commerce Commission . . . . Electrified structural mills at Homestead works of Carnegie Steel Co. are started when Judge Gary passes hand over glass sphere in his New York office . . . . Advances in magnetic testing, in X-ray developments, in fatigue studies and in general research are reviewed at silver jubilee meeting of American Society for Testing Materials . . . . Chamber of Commerce of United States undertakes survey to determine extent and tendencies of industrial migration.

Metal Trades in Review

July

AVERAGE price of heavy melting steel scrap at Pittsburgh, Philadelphia and Chicago reaches $13.48 a ton, the lowest level since early in 1922 . . . . Agreement on definitions for terms relating to heat treatment is reached by American Society for Testing Materials, American Society for Steel Treating and Society of Automotive Engineers after six years of negotiations . . . . Construction contracts during June in 37 Eastern States, amounting to $632,478,000, set new high record . . . . American Rolling Mill Co. purchases Columbia Steel Co. and Forged Steel Wheel Co., with plants at Butler, Pa., and Elyria, Ohio . . . . River shipments of pig iron from St. Louis industrial district are revived after nearly a half century's intermission . . . . American Manganese Producers' Association is formed to further production, beneficiation and use of domestic manganese-bearing ores and retain existing tariff on manganese products . . . . Tariff Commission begins hearing on fluorspar at request of domestic producers that duty be increased 50 per cent . . . . Intensive development of Russian metals industry involving an ultimate expenditure of $300,000,000 in iron and steel plants is announced here.

August

DOMESTIC steel producers ask for application of anti-dumping act on imports of German rolling mill products. . . . Merger of six large manufacturers of radiators and boilers as National Radiator Corporation embraces fifth of country's output . . . . Elbert H. Gary, chief executive officer of United States Steel Corporation, president of American Iron and Steel Institute and recognized leader of industry, dies in eighty-first year . . . . Weirton Steel Co.'s strip sheet mill, rolling strip sheets up to 48 in. wide, is third continuous sheet or strip rolling mill to be put into operation during year.

September

MACHINE Tool Congress, formed to provide a forum for discussion of mutual questions by users, distributers and makers of machine tools, holds first meeting at Cleveland in connection with National Machine Tool Exposition . . . . National Metal Week observed at Detroit by joint meeting of American Society for Steel Treating, American Welding Society and Society of Automotive Engineers . . . . British steel makers announce agreement to allow rebates to all consumers who use only materials of British origin . . . . Blast furnaces and other assets of Rogers-Brown Iron Co., Buffalo, are purchased by M. A. Hanna Co.

October

PROPOSED reduction in export freight rates on iron and steel articles from Pittsburgh district to North Atlantic ports is announced. . . . Foreman training in United States has increased several hundred per cent in last year, survey shows . . . . Charles M. Schwab, chairman of Bethlehem Steel Corporation, succeeds Elbert H. Gary as president of American Iron and Steel Institute . . . . Contract is let for largest suspension bridge ever designed, spanning Hudson River at New York, which will require 70,000 tons of structural steel and 31,000 tons of wire cable . . . . Composite price of finished steel reaches 2.293c. per lb., the lowest level since August, 1922.

November

NEW billet and rod mill with delivery maximum of 4000 ft. per min., exceeding fastest previous mill by 500 ft. per min., is placed in operation at Worcester plant of American Steel & Wire Co. . . . . Composite pig iron price reaches $17.54 per ton, the lowest in more than 11 years . . . . Iron and steel division of American Society of Mechanical Engineers holds first meeting at Youngstown, Ohio. . . . Negotiations completed for amalgamation of Republic Iron & Steel Co. and Trumbull Steel Co., which will bring together total ingot capacity of 1,900,000 tons and wide range of finished products . . . . German industry approaches pre-war status with pig iron production within 23 per cent of 1913 and production of finished steel within 6 per cent of pre-war year.

December

DISCOUNT of 10 per cent on carload lots and average price advances of 15c. to 20c. a keg are embodied in new card of extras on wire nails . . . . November steel ingot production, at 119,300 tons daily, reaches lowest point since July, 1925, while daily pig iron production of 88,279 tons, is lowest since August of that year . . . . Bethlehem Steel Co. adopts mill bases on bars, plates and shapes, quoting prices f.o.b. Bethlehem, Coatesville, Sparrows Point and Lackawanna instead of on Pittsburgh base . . . . Objections of German producers to resuming 8-hr. day may lead to suspension of operations in German iron and steel plants . . . . Joseph G. Butler, Jr., pioneer steel maker of Mahoning Valley, dies on eve of eighty-seventh birthday. . . . Treasury Department finds that German steel is not being dumped into the United States . . . . James A. Farrell is elected chief executive officer of the United States Steel Corporation, succeeding the late Judge Gary.

Unemployment—A New By-Product of Prosperity

Surplus Labor Released by Technical Improvements in Production Is Gravitating to Luxury Industries—Wage Trend, Colorado Strike and Employee Representation Surveyed

UNEMPLOYMENT no longer finds its cure in prosperity. Not only is there surplus labor in overdeveloped industries like coal mining, but more and more man power is being released by technical improvements in production. A new problem in industry has arisen: What is to be done with the labor dispensed with by better methods and more highly developed equipment? Are luxury industries the logical outlet for our new unemployed?

This and other phases of current industrial relations were discussed in an IRON AGE interview with Arthur H. Young, for many years identified with employment work in the iron and steel industry and now industrial relations counsel in New York. The first question put to him was:

"To what extent has employment declined in manufacturing industries during 1927?"

"There has been a marked decline," replied Mr. Young. "Its extent is shown by the Bureau of Labor Statistics index, which receded from a high of 91.4 in March to 87.3 in October, with an estimated figure of approximately 85 in December. This was a drop between the high and low points in the year of about 7 per cent, which means roughly that at the close of 1927 there will be approximately 600,000 fewer persons employed in manufacturing industries than in March of 1927, and upward of 400,000 less than in December, 1926."

"Does this decline reflect a swing toward industrial depression?"

"No; paradoxically, the cause of unemployment at this time does not lie in a lack of prosperity—rather it is largely traceable to prosperity.

"Capital has been abundant and has gone back into production in the form of great increases in mechanization and new processing. Management is more than ever on the alert to improve methods, as well as cut costs through reduction of personnel. Properly applied incentives and employee cooperation also have increased production per man. A new phenomenon in the industrial world—technological unemployment—is the result.

"Of course, there are added to those unemployed because of the reasons just considered those affected by the coal strike, the period of shutdown at the Ford plants, and the reduction in expenditures by railroads and public utilities. This whole situation suggests that the problem of unemployment is not entirely solved by ironing out seasonal variations or by achieving business prosperity."

"If the working forces of industry are steadily being reduced, what outlet remains for the labor thrown out of employment? Will there be a new movement to the land?"

"No, the same forces that are eliminating labor in the factory are at work on the farm. The mechanization of agriculture is at hand. The tractor and tractor-drawn implements have passed through the experimental stage and are now finding general adoption. The reaper-thresher, also known as the combine, has proved a success not only in the drier plains States, but also in the moister climate of the Middle West. This equipment is materially reducing the amount of

A. H. YOUNG directs the activities of the Industrial Relations Counselors, Inc., New York, an organization that engages in research along industrial lines, makes surveys of industries and plants and acts as counsel in matters of personnel administration for a number of important industrial corporations. Mr. Young's first contact with industry was as a boy at the Joliet, Ill., works of the Illinois Steel Co. From there he went to the Minnequa plant of the Colorado Fuel & Iron Co., Pueblo, Colo., and in 1905 returned to the Illinois Steel Co., taking a position of timekeeper at its Chicago works. He was subsequently chief payroll clerk, statistician, assistant supervisor of labor, chief safety inspector and supervisor of labor and safety. In 1917 Mr. Young left the Illinois Steel Co. to become director of the American Museum of Safety and served as the Government's chief safety expert during the war.

From July 1, 1918, to July 1, 1924, Mr. Young was manager of industrial relations at the International Harvester Co., Chicago. He was a co-author of the Harvester Industrial Council Plan and was responsible for the administration of this significant development in employee representation. He was president of the National Safety Council from 1921 to 1922 and is vice-president of the American Museum of Safety. In 1919 the museum awarded him the Louis Livingstone Seaman medal for conspicuous accomplishment in safety. In July, 1924, Mr. Young became industrial relations counsel for the law firm of Curtis, Fosdick & Belknap, New York. The industrial relations staff of the firm was reorganized as the Industrial Relations Counselors, Inc., in May, 1926.

labor required per acre, thereby insuring the same yield with a smaller number of farm operatives."

"If gains in the technology of industry, as well as of farming, mean smaller working forces, what is to become of our unemployed?"

"This question cannot be answered without challenging established ideas. Chastened by our age-long struggle for mere subsistence, we instinctively recoil from any tendency toward increased consumption of luxuries. Since thrift is essential to build up new reserves of capital, luxuries have been regarded as an economic waste and a threat to sustained prosperity.

"Yet it is precisely in the purveying of luxuries and services of various kinds that labor released by industry is finding employment. Automobile manufacture, still classed by many as a luxury industry, has created a vast market for labor, not only in the building of motor cars, but in the construction and patrolling of roads, and in the operation of countless oil stations, garages, refreshment stands, road houses and hotels. It has stimulated the growth of two great sister businesses, the cement and oil industries. The far-reaching effects of the automobile are seen in every phase of our economic life. Similarly, although on a smaller scale, the radio industry is offering opportunities to surplus labor."

Luxury Industries Needed to Support Basic Industries

"Is it your opinion that luxury industries are needed to sustain mass production in the basic industries?"

"Yes. Mass production implies mass demand. It would be futile for so-called essential industries to lower costs through labor saving, if in the same stroke they curtailed their markets by releasing labor which could not find employment elsewhere. Man's mastery over nature has passed the point where the Malthusian theory can be taken seriously. We no longer believe in the fatalistic doctrine that if wages increase, population is sure to multiply until wages are forced back to a subsistence level. Mass production and its companions, waste elimination and standardization, are decreasing costs to such an extent that man can enjoy the necessities of life and a fair measure of luxuries besides. If only part of the population is required to supply the necessities, it is obvious that surplus labor is available to increase the pleasures and comforts of life.

"However, I do not wish to be misunderstood. I have been discussing broad trends. Progress toward balanced industrial relations is not a uniform, sweeping movement. In a complex organism like modern industry it is inevitable that the response to economic stimuli should be more rapid in some directions than in others.

"During the past year it has been recognized more widely than ever before that a large section of the general body of laborers has been sharing little, if at all, in the prosperity of the last few years. In an investigation made by the Bureau of Labor Statistics it was found that unskilled laborers as a class were receiving rather meager wages and were not regularly employed. The highest paid group was found in the bituminous coal mining industry and earned as much as $37.69 per full-time week. The lowest earnings were found in the same industry and ranged from $10.34 to $11.03 per week for inside and outside laborers. During the last few years employees in coal mines have averaged about 180 days per year, or the equivalent of 30 full-time weeks. In the lowest paid districts, the average weekly pay for all the industries investigated would run under, rather than over, $17 per week, while for all districts the average apparently would be about $25 per week."

Present Trend of Wages Downward

"What is the general tendency of wages at the present time?"

"From January through August, the total amounts disbursed as payrolls in manufacturing industries failed to fall off as much as employment, so that the average earnings of persons remaining at work increased over 1926. This does not mean, however, that the persons who remained at work necessarily received increases in wages, because, in many industries, it is known that unskilled laborers were the ones laid off and the average pay of those remaining on the rolls would naturally show an increase. Since August, moreover, payroll totals have been declining more rapidly than has the number of employees, and the index of average per capita earnings, constructed by the Bureau of Labor Statistics' figures, has fallen below the corresponding figures of 1926. This fact would seem to point to some cutting of wages, though published reports of agencies collecting such information continue to show a preponderance of increases of wages over decreases. The number of firms reporting to these agencies is small, however, so that there is room for question whether the reports are really representative of conditions.

"High average per capita earnings with a declining trend in the cost of living resulted in sharply rising real earnings in the first half of 1927. During the latter half of the year, however, average per capita earnings have been declining and, on the whole, real earnings have been declining in about an equal, if not greater, ratio."

The Colorado Strike and the Works Council Plan

"The coal strikes were the major industrial disturbances during 1927. Does the Colorado strike indicate a break-down of the works council plan which has been in effect in some of the largest mining operations in that State?"

"No. It cannot fairly be said that the works council plan failed. Rather, the increased mobility of pickets through the use of automobiles widened the effectiveness of organized intimidation.

"The strike was called on Sept. 4 by leaders of the Industrial Workers of the World. This general strike had its beginnings in a four-day strike called late in August as a protest against the Sacco-Vanzetti decision. Both the protest and general strikes centered originally around the communities of Aguilar and Walsenburg in which are maintained I. W. W. headquarters. The general strike meeting held at Aguilar on Sept. 4 demanded a five-day week, a 6-hr. day and a 40 per cent increase in daily wages. After an investigation by members of the State Industrial Commission of both the protest and general strikes, announcement was made that the strikes were illegal, and the leaders did not properly represent the workers. The strikers were warned against picketing and advised to return to work. Although the agitation had its inception in the southern coal fields, the movement spread into some of the northern counties, which were seriously affected by the time a strike actually occurred on Oct. 18.

"In many of the mines, both in the southern and northern part of the State, employees were loyal and preferred to continue operations, but for reasons of general safety, managements decided that it was advisable to shut down.

"On Oct. 1 the Colorado Fuel & Iron Co., in negotiations with its employee representatives, granted a wage increase, which was followed by similar action by

other bituminous companies in the southern field. No action on wages was taken at this time by the lignite mines, although during the strike the Rocky Mountain Fuel Co., whose Columbine mine was the only one in the northern field to operate after the strike was called, agreed to a 50 per cent increase in wages.

"Toward the end of October the picketing activities of the strikers multiplied. The spread of the strike and maintenance of morale among the strikers are largely due to the use of the automobile in carrying organizers, speakers and large groups of strike leaders from mine to mine. The frequency of encounters between pickets and company representatives engaged in protecting property increased and there were some incendiary fires. On Oct. 24 the Governor of the State visited the scenes of the strike, and on Oct. 30 the Adjutant-General of the State announced that picketing must cease. The month of November saw some general improvement as a result of the activities of the State and organized effort of employees who desired to cooperate with managements in resuming operations.

"Just at the time when the situation seemed to be adjusting itself the head of the Law Enforcement Bureau of Colorado ordered his men to fire upon a company of striking coal miners who were advancing toward the Columbine mine and, according to press dispatches, five were killed and several wounded. This tragedy has brought the whole situation to the forefront in glaring headlines and again focused public attention upon the coal mining industry in Colorado."

Labor Unions and Employee Representation

"What is the general attitude of labor organizations toward works councils?"

"At the 1926 convention of the American Federation of Labor, held in Detroit, there was considerable discussion of employee representation, resulting in a resolution strongly condemning such arrangements and a resolution empowering the executive council to levy a special assessment to be devoted to a thorough investigation and report on the so-called company unions. There are no indications that this plan is being carried out, but instead, weak and perhaps easily vulnerable individual company plans are being attacked. At the 1927 convention, held in Los Angeles, there was no reference to the project, while expressions of endorsement were given to union-management plans of cooperation of the Baltimore & Ohio Railroad type, with expressions of desire for further developments along this line. Personally, I cannot see that bona fide employee representation and enlightened trade unionism are mutually exclusive. In any event, it is a rather wholesome outlook to view all of the principal factors in the industrial equation vying with each other for success through measures of cooperation rather than conflict."

SCRAP PRICE DECLINE CHECKED

Pig Iron and Finished Steel Are Lower Than for Some Time Past

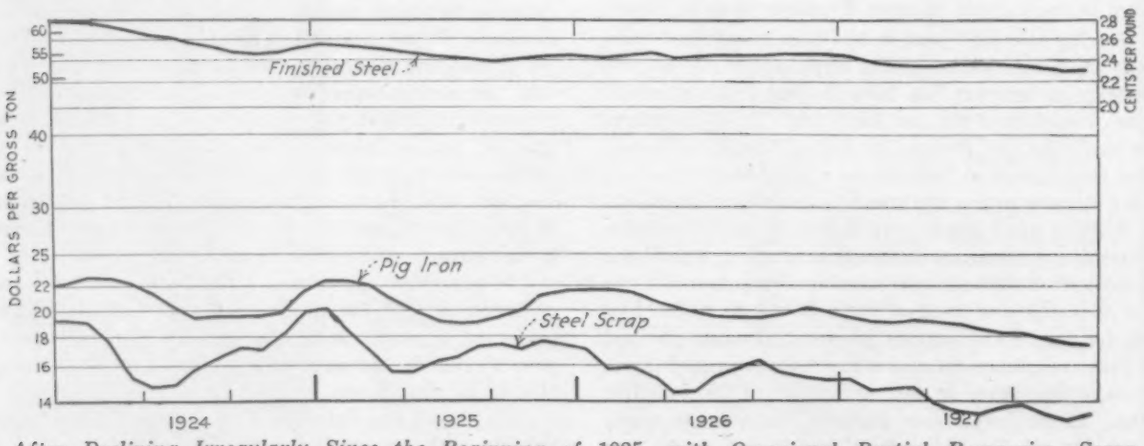
AVERAGE prices of heavy melting steel scrap at Chicago, Pittsburgh and Philadelphia have moved upward slightly from the low level of a month ago. November at $13.18 showed the lowest average for any month in several years, but December at $13.48 showed a recovery which was participated in by all three markets. It paralleled a similar, but short-lived, recovery in the third quarter. The average for the fourth quarter, however, at $13.38, was considerably lower than for any other quarter in more than five years. It compared with $14.09 in the second quarter of this year, and $13.73 in the third quarter. The average for the year was $14 a gross ton.

Pig iron reached in September the lowest level since before the United States entered the World War, and has gone still lower. The average composite price for December was $17.55, compared with $18.55 as recently as July. For the fourth quarter of the year, the average was $17.70.

Finished steel, while it has maintained a measurably uniform price for some months, was lower in November than in any month since 1922. The average was 2.299c. a lb., compared with 2.319c. for October and with 2.310c. for December.

COMPOSITE PRICES ON IRON AND STEEL PRODUCTS

	(Per Gross Ton)		
	Steel Scrap	Pig Iron	Finished Steel, Per Lb.
1925 average	*$17.12*	*$20.58*	*2.465c.*
January, 1926	16.97	21.79	2.447c.
February	15.50	21.77	2.428c.
March	15.83	21.65	2.433c.
April	15.27	20.96	2.439c.
May	14.35	20.69	2.416c.
June	14.40	20.00	2.420c.
July	15.42	19.51	2.431c.
August	15.88	19.46	2.431c.
September	16.25	19.46	2.439c.
October	15.58	19.69	2.449c.
November	15.25	20.13	2.453c.
December	15.08	19.94	2.453c.
Year's average	*15.48*	*20.42*	*2.439c.*
January, 1927	15.17	19.44	2.432c.
February	14.58	19.07	2.378c.
March	14.65	19.03	2.367c.
April	14.71	19.21	2.360c.
May	13.95	19.09	2.360c.
June	13.60	18.92	2.369c.
July	13.48	18.56	2.367c.
August	13.80	18.17	2.367c.
September	13.92	18.03	2.357c.
October	13.48	17.96	2.319c.
November	13.18	17.59	2.299c.
December	13.48	17.55	2.310c.
Year's average	*14.00*	*18.55*	*2.357c.*



After Declining Irregularly Since the Beginning of 1925, with Occasional Partial Recoveries, Scrap Prices Appear to Have Reached Bottom and to Be Headed Slowly Upward. Pig iron and finished steel have been falling during the same period, but much less abruptly

Japan a Growing Producer of Steel

Industry a Quarter Century Old Is Supplying More Than Half of Domestic Requirements in Finished Steel Products

BY GEORGE S. HERRICK

IN viewing the steel industry of Japan, it is perhaps well to bear in mind that, in contrast with the other steel producing nations of the world, it is a modern development by a people who have entered into an industrial era in comparatively recent times. Although the Imperial Government, convinced of the need of some domestic production of iron and steel, founded the Seitetsu Jo at Yawata in Kiushu (usually known as the Yawata or Imperial Steel Works) in 1896, a broad expansion of Japanese production did not occur until about the time of the Russo-Japanese war, 1904 to 1906.

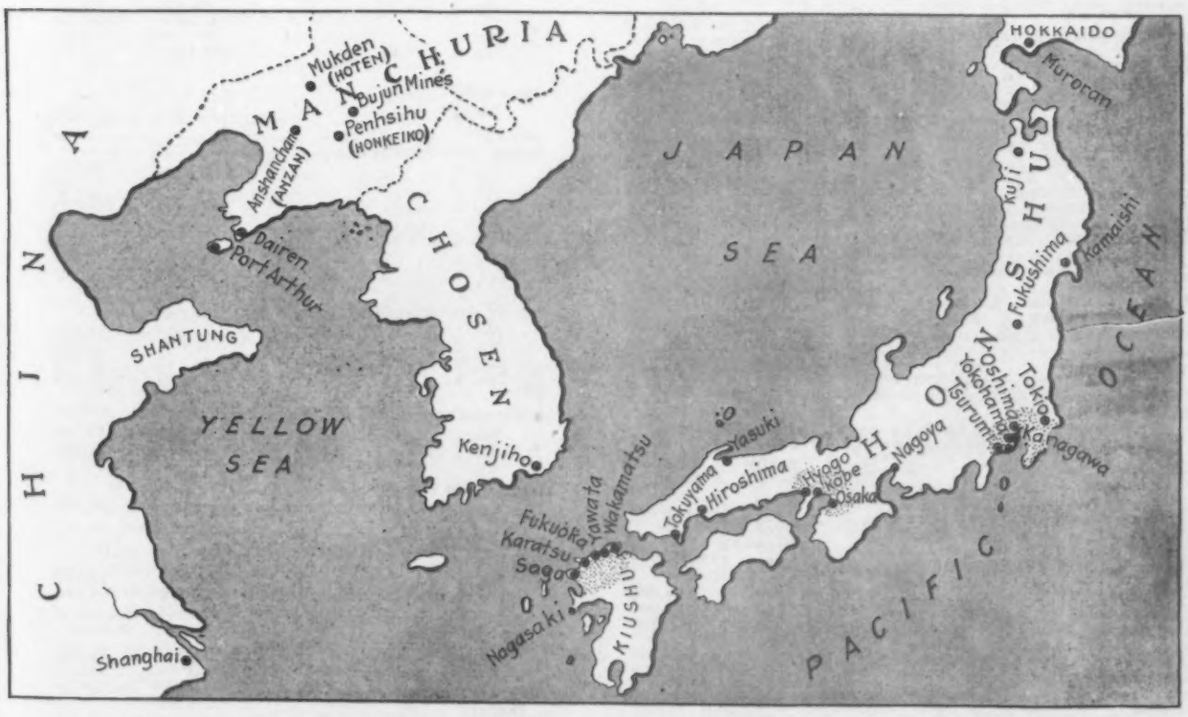
Prior to the war with China, 1894 to 1895, production of iron was in a rather primitive state, with the total output probably not more than 5000 or 6000 tons a year. By 1896, however, it is estimated that Japan's consumption of pig iron was about 65,000 tons a year and of steel products more than 200,000 tons a year, of which only about 25,000 tons of pig iron and about 1000 tons of steel products were produced domestically.

Seitetsu Jo Leading Producer

The Seitetsu Jo (Imperial Steel Works) was established by Imperial edict in March, 1896, and construction began the following February, but it was not until almost four years later that the first blast furnace, with a capacity of about 160 tons a day, was blown in. Not until 1901 did the Government works enter into the production of steel. Under the original plans the plant was to have a capacity of 60,000 tons of finished materials a year, but before construction was completed the annual capacity had been increased to about 90,000 tons.

Proving of great benefit during the war with Russia, plans were immediately laid to increase the capacity of the works to about 180,000 tons a year, expansion for which was completed about 1909. There have been additional units completed since then, so that today it is claimed that the Seitetsu Jo has a total capacity of close to 1,000,000 tons of steel ingots annually.

In 1901, according to statistics recently published by the *Japan Advertiser*, the total production of pig iron in Japan was about 57,000 tons, of which the Seitetsu Jo at Yawata contributed about 30,000 tons. Of the total output of 6000 tons of steel in this year, the Government works produced about 5000 tons. In 1910 the Seitetsu Jo supplied about 129,000 tons of the total of 189,000 tons of pig iron produced and about 160,000 tons of the 168,000 tons of steel ingot output. Private enterprise was still of little consequence. By 1913, however, the total output of pig iron was 242,676 tons, of which the Government works' share was 179,000 tons, and the total production of steel was 254,952



EXCEPT for a Few Mills, the Steel Industry Is Grouped in Three Great Industrial Districts, About Yokohama, Kobe, and on the Island of Kiushu, Site of the Government Works. A steel works in Chosen and blast furnaces in Manchuria have been established and considerable expansion of these plants is planned

tons, with the Government works contributing 216,000 tons.

As in the past, so today the Seitetsu Jo, representing a total investment by the Government of about 160,000,000 yen, is the leading steel interest in Japan by a considerable margin. According to the recent census (1925), the Government works employs more than 16,000 workmen on full time and about 6000 or more on part time. It has also about 12,500 miners, and the offices give employment to about 2200, including executives.

The principal products of the works, which is equipped with six blooming and billet mills, nine structural mills, one rail mill, three plate mills, two sheet mills, one wire rod and one bar mill, in addition to six blast furnaces, 29 open-hearth furnaces and two Talbot furnaces, are steel bars, plates and shapes, wire rods, rails in 12, 18, 20, 30, 45, 60, 75 and 91-lb. sections, steel axles and tires, universal plates, black and galvanized sheets, electrical sheets, tin plate and tool steel. Although the mills have equipment for the manufacture of pipes and tubes and wire, production has been suspended as an aid to private producers of these materials.

The Seitetsu Jo is the only producer of tin plate in Japan, with an annual capacity of about 250,000 base boxes. The first sales of tin plate were made in July, 1923, and in the following nine months, into March, 1924, 15,760 boxes per month were produced, of which it is reported that 65 per cent were primes, 34 per cent seconds and 1 per cent of lower grade.

The total investment in the steel industry of Japan is estimated at more than 400,000,000 yen, and as much as 500,000,000 yen, of which 160,000,000 yen or more is in the Government-owned mills of the Seitetsu Jo. While the valuation of the Government plant may be accepted as fair, as much cannot be said in all cases for privately owned companies, which have been over-capitalized. The companies, except for certain leading producers, are said to have over-valued their plant and equipment, and in many instances, during the war and post-war periods, to have borrowed money year after year from the banks to maintain dividends not warranted by the exceedingly small profits.

System of Subsidies to Steel Producers

A practice which has probably assisted to a great extent in bringing about the present unfortunate economic condition, which culminated in the failures and suspensions early this year, was the system of subsidies paid by the Government. Their object was to aid in the upbuilding of a steel industry which would tend to make Japan self-contained, produce greater industrialization to offset in part the rapid increase in population and at the same time contribute a valuable arm to the national defense.

The system is complex and extensive. In the main, private steel companies which are in a position to meet certain requirements are granted subsidies permitting a guaranteed dividend rate to shareholders.

Aided by these payments and as a result of the normal growth of a steel industry to supply part of the domestic demand, Japan is today producing black sheets of various gages, has a large galvanizing industry, and a fair output of bars and structural material, a rather large production of wire and wire nails, and a small tonnage of special materials, such as electrical steel sheets and tool steel. It is the purpose of the Government to make the country self-contained as far as possible in the production of steel, but, faced with a limited and poor iron ore supply and low-grade coal, this promises to be difficult of attainment.

Iron Ore Resources Limited

A report by the Department of Agriculture's soil bureau places the iron ore resources of Japan proper

Open-Hearth Capacity in Japan

Company	No. of Furnaces	Capacity Tons	Annual Output Max.	Annual Output Ave.
Imperial Steel Works, Yawata	2*	200	1,065,000	1,000,000
Imperial Steel Works, Yawata	11	60		
Imperial Steel Works, Yawata	6	50		
Imperial Steel Works, Yawata	12	25		
Kiushu Seitetsu Jo, Wakamatsu	3	50	112,500	70,000
Asano Zosen Sho, Tsurumi, Yokohama	3	25	56,250	53,000
Osaka Teppan Seizo Kaisha, Osaka and Tokuyama	2	25	37,500	30,000
Sumitomo Seitetsu Jo, Osaka	3	25	56,000	45,000
Kawasaki Zosen Sho, Kobe, Kawasaki Works	8	25	150,000	130,000
Hyogo Works	2	25	37,500	30,000
Kobe Seikojo Kaisha, Kobe	2	25	37,500	30,000
Nippon Kokan Kabushiki Kaisha, Kanagawa	9	25	168,750	140,000
Kamaishi Kozan Kaisha, Kamaishi	3	25	56,250	50,000
Mitsubishi Seitetsu Kaisha, Kenjiho, Chosen	3	50	112,500	90,000
Total	69		2,040,000	1,668,000

NOTE: The total of all open-hearth furnaces in Japan including capacities from 3-ton to 25-ton, not recorded in this list, is 121.
*Talbot.

Blast Furnace Capacity in Japan

Company	No. of Furnaces	Daily Output	Annual Capacity
Seitetsu Jo (Imperial Steel Works)	2	270	510,000
Seitetsu Jo (Imperial Steel Works)	1	235	
Seitetsu Jo (Imperial Steel Works)	3	200	
Nippon Seitetsu Jo, Wanishi	1	100	100,000
Nippon Seitetsu Jo, Wanishi	2	120	
Mitsubishi Seitetsu Kaisha, Kenjiho, Chosen	2	200	130,000
Anzan Seitetsu Jo, Anzan, Man	2	300	200,000
Toyo Seitetsu Kaisha, Tobata	1	150	150,000
Toyo Seitetsu Kaisha, Tobata	1	300	
Kamaishi Kozan Kaisha, Kamaishi	2	200	130,000
Honkeiko Seitetsu Jo, Manchuria	2	130	80,000
Asano Zosen Sho, Tsurumi, Yokohama	1	150	50,000
	20	2,355	1,350,000

NOTE: Blast furnaces with a daily output of less than 100 tons are not included in this list.

Rolling Mill Capacity in Japan
(Metric Tons)

	Max. Capacity	Ave. Output
Seitetsu Jo (Imperial Steel Works) Yawata		
Blooming and billet mills:		
No. 1	210,000	147,000
No. 2	240,000	168,000
No. 3	300,000	210,000
No. 4	300,000	210,000
No. 5	300,000	210,000
No. 6	450,000	315,000
Rail mills:		
No. 1	100,000	80,000
Large structural mills:		
No. 1	90,000	63,000
No. 2	120,000	84,000
No. 3	150,000	105,000
Medium size structural mills:		
No. 1	45,000	31,500
No. 2	60,000	42,000
Small size structural mills:		
No. 1	30,000	24,000
No. 2	30,000	24,000
No. 3	45,000	36,000
No. 4	45,000	36,000
Plate mills for 5 mm. and heavier:		
No. 1	90,000	63,000
No. 2	60,000	42,000
Sheet mills for less than 5 mm.:		
No. 1	40,000	28,000
Sheet mills for 0.7 mm. and thinner:		
No. 1	26,000	18,200
No. 2 (electric sheets)	7,000	4,900
Wire rod mills:		
No. 1	50,000	35,000
Mill for flats (sheet bars or skelp):		
No. 1	37,000	29,600
Pipe:		
Small tonnage of medium sizes only.		

at approximately 70,000,000 tons, including about 750,000 tons of sand ore. Estimating the demand for pig iron and finished steel in Japan at about 300,000 tons of pig iron and 1,680,000 tons of finished products annually, the following computation of iron ore requirements might be made: For the production of the 1,680,000 tons of finished steel, it is estimated that 2,350,000 tons of semi-finished material would be required, and this would necessitate the use of about 1,900,000 tons of pig iron in addition to scrap.

The production of such a quantity of pig iron would require approximately 3,800,000 tons of 50 per cent iron ore and about 2,000,000 tons of coke. Consumption of iron ore at the rate necessary for the estimated full requirements of Japan would soon exhaust the present known resources and in addition Japanese coal is said to be for the most part high in sulphur, phosphorus and ash content and highly volatile. At present the Seitetsu Jo at Yawata is importing its ore supplies from China and the South Sea Islands.

In 1925, in addition to the imports of pig iron from Manchuria and Chosen, of which about 100,000 tons came from the Anzan Steel Works of the South Manchuria Railway Co. and the Honkeiko Seitetsu Jo (Honkeiko Steel Corporation), also in Manchuria, and about 75,000 tons from the Mitsubishi Seitetsu Kaisha at Kenjiho, Chosen, about 150,000 tons of iron was imported from the Tata, Bengal and Burn interests in India, and 50,000 tons from the Hanyang Iron & Steel Works, Hankow, China.

While there is considerable iron ore in Manchuria, most of which is hematite, the percentage of iron content is not large, being generally about 36 to 40 per cent. It is, however, worked to advantage. One deposit is at Meaoerkou, about 24 miles from Penhsihu, the site of the Honkeiko Seitetsu Jo, and according to production figures of this operation for 1921, the total output was about 67,500 tons of ore. The other mine is at Anzan (Chinese: Anshanchan), the site of the South Manchuria Railway Co.'s Anzan Steel Works, and the production of iron ore in 1921 is given as 143,364 metric tons. Both deposits are of iron ore analyzing about 36, to as high as 40, per cent iron content.

Sand Ore May Be Used for Sponge Iron

The desire to extend the ore resources of the country as greatly as possible has led to a considerable development of interest in the Anderson-Thornhill process for production of iron from sand ores. Experiments have been carried out at the Kuji Seitetsu Jo (Kuji Steel Works), recently established in the northeastern part of Japan, and some success is claimed by the promoter, M. Matsukata, although the patentees of the process are far from satisfied.

Following an investigation by an engineer of the Imperial Trade Department, it was reported that the sponge iron made was found on analysis to contain

Rolling Mill Capacity in Japan
(continued)

	Max. Capacity	Ave. Capacity
Kiushu Seitetsu Jo, Wakamatsu		
Blooming and billet mills	210,000	147,000
Large structural mill	75,000	52,500
Plate mill for less than 5 mm.	40,000	28,000
Mitsubishi Seitetsu Kaisha, Kenjiho, Chosen		
Blooming and billet mills	300,000	210,000
Large structural mill	90,000	63,000
Plate mills for 5 mm. and heavier	60,000	42,000
Kawasaki Zosen-Sho, Kobe		
Small size structural mills, Hyogo Mill	20,000	12,000
Plate mills for 5 mm. and heavier, Fukiai Mill	60,000	42,000
Sheet mills for 0.7 mm. and thinner, Fukiai Mill	20,000	14,000
Kobe Seikojo Kaisha, Kobe		
Medium size structural mill	30,000	21,000
Small size structural mill	20,000	16,000
Sumitomo Seitetsu Jo, Osaka		
Medium size structural mill	30,000	21,000
Wire rod mill	50,000	35,000
Pipe rolling mill	24,000	16,000
Nippon Kokan Kabushiki Kaisha, Kanagawa		
Medium size structural mill	60,000	42,000
Small size structural mill	40,000	32,000
Pipe rolling mill	30,000	21,000
Tokio Kozai Kaisha, Fukushima-Ken, Tokio		
Medium size structural mill	20,000	14,000
Small size structural mill	20,000	16,000
Asano Zosen Sho, Tsurumi, Yokohama		
(Kokura) Small size structural mill	30,000	24,000
(Tsurumi) Plate mills for 5 mm. and heavier	60,000	42,000
(Kokura) Wire rod mill	50,000	45,000
Osaka Seitetsu Kaisha, Osaka		
Small size structural mill	20,000	16,000
Fuji Seiko Kaisha, Hiroshima		
Small size structural mill	20,000	16,000
Kamaishi Kozen Kaisha, Kamaishi		
Small size structural mill	40,000	32,000
Osaka Teppan Kaisha, Tokuyama		
Sheet mills for 0.7 mm. and thinner, Tokuyama Mill	20,000	14,000
Tokai Seitetsu Jo		
Medium size structural mills	30,000	21,000
Plate mills for less than 5 mm.	25,000	17,500

Wire Nail Production in Japan by Districts

	Kegs per Month
Tokio	
Tokio Galvanizing Works	3,000
Kashiwa Galvanizing Works	3,000
Kobari Shoten	1,500
Aoki Shoten	1,000
All other plants	500
Total	9,000
Osaka	
Amagasaki Nail Works	10,000
E. Nakayama	3,000
Yohta	1,000
Yamamoto Nail Works	900
Satake Nail Works	800
Nakagawa Nail Works	500
Wyeda Nail Works	500
Watanabe Nail Works	500
Nippon Densen Mfg. Co.	500
Ikeda Nail Works	500
Ohuo Nail Works	800
Tominaga Nail Works	1,000
Waki Wire Mfg. Co.	7,000
Ishii Tekko-Jo	800
Tekeishi Wire Mfg. Co.	800
Kito Shoten	500
Fujiuchi Shoten	800
Fukuma Seikojo	1,000
Tokumoto Shoten	700
Koyama Shoten	300
Kate Shoten	800
Morino Shoten	300
Shano Shoten	500
Kano Shoten	800
Miki Shoten	480
Osaka Wire Mfg. Co.	800
Shinko Nail Works	500
Naniwa Nail Works	800
Sagimori Shoten	500
Mikkaichi Nail Works	1,000
U. Sakano	1,000
Tamura Shoten	480
Murata Shoten	480
Koyama Shoten	800
Wakayama Nail Works	500
Mikasa Nail Works	500
Total	42,140
Western District	
Yasuda Nail Works	32,000
Hiroshima Nail Works	500
Matsumoto Seiko	500
Tadozu Nail Works	400
Okashima Nail Works	300
Tanaka Shoten	500
Total	34,200
Nagoya	
Nippon Nail Works	1,600
Yoshida Nail Works	1,500
Hokuriku Nail Works	800
Koyama Nail Works	500
Kamezaki Nail Works	800
Total	5,200
Others	
Sakamoto Nail Works	480
Iwasa Nail Works	480
Nyemura Nail Works	480
Seo Nail Works	320
Ube Nail Works	320
Imaharu Nail Works	320
Ohmura Nail Works	320
Ohsato Nail Works	480
Sanyo Nail Works	480
Total	3,680
Total Production of All Works	94,220

Wire Production in Japan by Districts
(Metric Tons)

	Capacity per Month
Tokio	
Tokio Seiko Kaisha	1,500
Tokio Galvanizing Works	1,000
All other plants	600
Total	3,100
Osaka and West	
Inui Wire Mfg. Co.	1,500
Nippon Densen Co.	300
Osaka Teppan Kaisha	300
Settsu Galvanizing Works	350
Ebisu Gumi	100
Waki Wire Mfg. Co.	350
Asano Steel Works	200
S. Asada	50
Marino Shoten	50
Yamada Wire Mfg. Co.	70
Takeishi Wire Mfg. Works	30
Nakatsuji Shoten	50
Nakai Shoten	50
T. Sakamoto	30
Yamaguchi Shoten	100
Mukai Shoten	100
T. Yagi	70
Yamanishi Shoten	50
Yamamoto Shoten	50
Moriuchi Shoten	50
Yagifuku Shoten	30
Akiyama Shoten	100
Matsukawa Shoten	30
Total	4,010

only about 80 per cent iron, while at least 90 per cent iron content would be required for successful working commercially. High cost of production is also a serious factor. Experiments, however, are being continued and satisfactory results are still expected by the Japanese promoters of the project.

Expansion After the War

Following the Armistice the industry was depressed, and to add to the troubles of the steel producers, came in 1921 the naval armament conference at Washington, with its restrictions on naval construction. Efforts to stabilize the industry and reduce competition met with little success, but in 1925 the Iron and Steel Association was organized, including as members the Seitetsu Jo of the Government and private companies. A pig iron sales organization was also established to control distribution. Subsidies to the steel makers were widely granted by the Government, and in 1926 a high tariff on iron and steel became effective as an added assistance to the industry.

Imports began to increase at this time and export trade suffered. It is estimated that about 65 per cent of the pig iron demand was supplied domestically in 1919, about 58 per cent in 1920, about 64 per cent in 1921, about 58 per cent in 1922, about 59 per cent in 1923, about 54 per cent in 1924 and about 64 per cent in 1925.

In steel bars and plates the percentage of domestic output to total consumption is estimated at about 36 per cent in 1920, about 50 per cent in 1921, about 40 per cent in 1922, about 54 per cent in 1923, about 46 per cent in 1924 and about 72 per cent in 1925. In recent years Japan has been an exporting as well as importing country in iron and steel. The total exports of pig iron and steel in 1924 were 860,691 piculs (51,295 gross tons), and in 1925, 911,204 piculs (54,306 gross tons).

Many Small Mills in Japan

Today there are in Japan 30 or more iron or steel producing companies in addition to the Seitetsu Joe of the Government, and numerous small manufacturers of special products, foundries, shipyards and similar plants. Of these there are 14 equipped with one or more rolling mills, including the Seitetsu Jo. There are five companies in Japan proper, with blast furnaces of 100 tons a day or more capacity, two in Manchuria and one in Chosen. There are three outstanding producers of sheets among these mills, and a fourth is reported entering into production. In all, there are 10 companies equipped with open-hearth furnaces of 25 tons capacity or larger, including the Seitetsu Jo and one company in Chosen, the Mitsubishi Seitetsu Kaisha at Kenjiho.

Steel Mills, Blast Furnaces and Manufacturers in Japan

Seitetsu Jo (Known as Imperial or Yawata Steel Works), Yawata, Kiushu: wide range of steel products: 6 B. F., two 12-ton converters, 12 25-ton O. H., 17 60-ton O. H. and two 200-ton Talbot furnaces.

Nippon Seikojo (Japan Steel Works), Wanishi and Muroran in Hokkaido (Mitsui owned); pig iron and special steel; 4 B. F. and 12 O. H. fur.

Kamaishi Kozan Kaisha (also known as Kamaishi Tessan Kaisha), Kamaishi, Iwate prefecture; mining and steel company; pig iron, bars, shapes, special steel, cast iron pipe, ferromanganese and spiegeleisen; 3 B. F. and three 25-ton O. H. furnaces.

Nippon Kokan Kabushiki Kaisha (Japan Pipe Mfg. Co.), Kanagawa; pipe and special steel, pig iron, bars, shapes, rails and accessories; nine 25-ton O. H. furnaces.

Mitsubishi Seitetsu Kaisha (Mitsubishi Steel Co.), Kenjiho, Hokai-Do, Chosen; pig iron, steel bars, shapes and tubes; 2 B. F., three 50-ton O. H. furnaces.

Daido Denki-Sho (Daido Electric Steel Works), Nagoya, special and high speed steel, ferroalloys and steel castings.

Asano Zosen Sho (Asano Shipbuilding Co.) Tsurumi, Kanagawa; bars, shapes, wire products, castings and forgings; 1 B. F. and three 25-ton O. H. furnaces.

Kobe Seikojo (Kobe Steel Works), Kobe (formerly Suzuki owned); bars, shapes, plates, castings, forgings and special steel; 1 B. F. and four 20-ton O. H. furnaces.

Nippon Seiko-Sho (Japan Special Steel Works), Tokio; high carbon and high speed steel.

Osaka Teppan Seizo Kaisha Ltd. (Osaka Steel Sheet Mfg. Co.), Osaka and Tokuyama, (Iwai & Co., owned); sheets and steel plates; two 25-ton O. H. furnaces.

Takata Kogyo Kaisha (Takata Industrial Co.), Takata, Fukushima-Ken; pig iron and special quality steel.

Tokio Kozai Kaisha (Tokio Steel Materials Co.), Tokio; pig iron and special quality steel and art metal work.

Tobata Chuko-Sho, Ltd. (Tobata Cast Iron Works), Tobata, Fukuoka-Ken; pig iron and castings.

Toyo Seitetsu Kaisha (Oriental Steel Co.), Tobata, Fukuoka-Ken; pig iron, steel ingots and small shapes; 1 B. F. and small O. H. furnace.

Kawasaki Zosen-Sho (Kawasaki Dockyard Co.), Kobe; sheets, plates, bars, shapes, steel castings, forgings and special steel; eight 25-ton O. H. furnaces at Kobe and two 25-ton O. H. furnaces at Hyogo.

Osaka Seitetsu Kaisha (Osaka Steel Co.), Osaka; small sized shapes; four 20-ton O. H. furnaces.

Sumitomo Seitetsu-Jo (Sumitomo Steel Works), Osaka; rolled products and wire, tubes, castings, forgings and special ordnance work; three 25-ton O. H furnaces.

Anzan Seitetsu-Jo (Anzan Steel Works), Anzan (Chinese Anshanchan), Manchuria (South Manchuria Railway owned); pig iron; 2 B. F.

Osaka Tekko-Jo (Osaka Steel Works, Ltd.); shipbuilding and about 5000 tons of cast iron pipe annually.

Fuji Seiko Kaisha (Fuji Steel Works), Kawasaki; pig iron and special steel; small capacity blast furnace.

Yasuki-Seitetsu-Jo (Yasuki Steel Works), Yasuki, Shimane-Ken.

Kiso Denki Seitetsu Kaisha (Kiso Electric Steel Mfg. Co.), Nagoga; electric furnace steel castings; one 1½-ton electric furnace.

Kiushu Seitetsu Jo (Kiushu Steel Works), Wakamatsu; plates and shapes; three 30-ton O. H. furnaces.

Sumidagawa Seitetsu-Sho (Sumidagawa Steel Works), Tokio; pig iron; small capacity blast furnace.

Honkeiko Seitetsu Jo (Honkeiko Steel Corporation), Penhsihu, Manchuria; pig iron; 2 B. F.

Nippon Chuko-Sho (Japan Cast Iron Co.), Osaka; iron castings.

Nippon Seitetsu Kaisha (Japan Iron Mfg. Co.), Fukuoka Prefecture; pig iron; small capacity blast furnace.

Pig Iron Production and Imports, 1913 to 1925

(Metric Tons)

Year	Domestic Production	Imports*	Exports	Total Consumed	Per Cent From Japanese Furnaces
1913....	242,676	273,310	358	515,628	47
1915....	320,627	172,685	400	492,912	65
1917....	462,792	235,082	3,322	694,522	62
1918....	606,428	267,741	1,146	873,023	70
1919....	612,609	348,707	1,894	959,422	64
1920....	529,875	390,298	2,514	917,659	58
1921....	480,300	276,284	3,693	752,891	64
1922....	559,310	409,606	3,699	965,217	58
1923....	610,751	429,442	5,231	1,034,962	59
1924....	598,405	520,122	6,319	1,112,208	54
1925....	685,178	400,000	....	1,085,178†	64

*Including Chosen and Manchuria.
†Exports, which are unreported, have not been deducted.

In the past few years Japan has entered into an intensive development of wire drawing and nail making capacity, so that today, as shown in the accompanying table, there are more than 25 wire-drawing plants in Japan with a total capacity of 7110 tons of wire per month, and some of these and a few which purchase their wire in the open market bring the total of nail works to more than 60, with a total capacity of 94,220 kegs of nails per month.

Sheet, Nail and Wire Capacity Expanded

Japanese efforts to establish a large sheet-rolling industry have created, perhaps, more interest in the United States and Great Britain than any other steel development effort of that country. The present rated capacity is more than 100,000 tons a year, although the actual output is considerably below this figure.

Japan remains a large consumer of light-gage black sheets, and in the past and today purchases practically all foreign requirements from the United States and Great Britain, with a limited tonnage from Germany. Great quantities of black sheets are consumed in Japan by the numerous galvanizing plants, the enameling industry and the makers of stoves and chimneys, as well as for building purposes.

Three Principal Sheet Producers

The first steel sheets rolled came from the Tokuyama mill of the Osaka Teppan Seizo Kaisha, Ltd. (Osaka Steel Sheet Mfg. Co.). This company, equipped with four stands of 28-in. rolls, 40 in. wide, prospered for several years. The company now has eight stands of rolls: two roughing, four finishing and two for cold rolling, producing heavy gages, 36 x 72 in. While the equipment can be used in rolling No. 30 gage black

sheets, for which there is so much demand in Japan, none of this gage is being produced at present. The total capacity of the Tokuyama mill is placed at about 3000 tons of sheets a month, but operations are only 50 to 60 per cent of this capacity.

The Nippon Seitetsu Kogyo Kaisha (Japan Steel Industry Co.) at Yatsuya, Fukuoka prefecture, was a later arrival in the field of black sheet production, and is equipped with four stands of rolls, 26 in. in diameter by 40 in. wide; one roughing, two finishing and one for cold rolling. Sheets 36 in. wide up to 96 in. long can be rolled on this mill, and the gages range from Nos. 10 to 20. The total capacity is set at 1000 tons a month, but output is about 45 to 50 per cent of this maximum.

The greatest sheet producer, the Kawasaki Zosen-Sho, Ltd. (Kawasaki Dockyard Co.), following financial reverses in the spring during the near-panic, is reported to have temporarily suspended operation of all but its shipbuilding activities, but efforts are being made to have other large interests in Japan take over the operation of its various plants, and its idleness is generally considered to be only temporary. The equipment for sheet rolling at the Kawasaki plant consists of eight roughing, 13 finishing and seven cold rolling stands with 30 x 44-in. rolls. This company has made a definite effort to produce No. 30 gage black sheets profitably, and, according to report, some measure of success has been attained. One of the greatest obstacles to profitable operation is said to be the difficulty in securing Japanese workmen who can stand the temperatures.

Some Plants Established Before the War

Between 1901 and 1913 the Kamaishi Kozan Kaisha (Kamaishi Mining Co.) at Kamaishi, now owned by the Mitsui interests, was established. Originally it was exclusively a blast furnace company, but today, in addition to two 200-ton furnaces with a rated annual capacity of 130,000 tons of pig iron, it has three 25-ton open-hearth furnaces, as well as several smaller ones and a small-sized structural mill with an average rated capacity of 32,000 tons a year.

Another steel company established in this period was the Wanishi works at Wanishi, now a part of the Nippon Seikojo (Japan Steel Works), also owned by the Mitsui interests. This works employs about 4000 workmen and produces pig iron, forgings, ordnance and special steel. Its equipment includes three blast furnaces with a rated annual capacity of 100,000 tons.

Other companies established at this time were the Sumitomo Seiko-Sho, Ltd. (Sumitomo Steel Works), at Osaka, and which produces wire, tubes, castings, forgings and special steel, and is equipped with rolling mills for medium-sized structural shapes, wire rods and pipe. The total rated annual capacity of this company for rolled products is placed at 72,000 tons. The Nippon Kokan Kabushiki Kaisha (Japan Pipe Mfg. Co.) at Kanagawa, established prior to 1913, manufactures pipe, bars, shapes, rails and accessories, and special steel. It is equipped with the medium and small-sized structural mills and a pipe rolling mill. It has nine open-hearth furnaces of 25 tons capacity each, and an annual output rated at 135,000 tons of steel ingots.

Another of these early companies is the Kobe Seiko Jo (Kobe Steel Works) at Kobe, formerly controlled by Suzuki & Co. This mill produces bars, shapes, plates, castings, forgings and special steel. It has medium and small sized structural mills with an annual rated capacity of 37,000 tons, two 25-ton open-hearth furnaces rated with an annual output of 30,000 tons of steel ingots and one blast furnace of small capacity. The Kawasaki Zosen-Sho, Ltd., was also established in this period of expansion in the steel industry.

World War Brings More Development

After 1914, the beginning of the World War, each year saw a few new steel companies established. In 1915 the Sanyo Seitetsu Sho, Ltd., was organized under the control of Okura & Co., and the Kishimoto Seitetsu Jo and Kokura Seitetsu Jo (now Asano Zosen-Sho) were formed. In 1917 the Fuji Seiko Kaisha (Fuji Steel Co.) was built at Kawasaki to roll special steel. This plant is now equipped with a small structural mill rated at about 16,000 tons a year. Other companies established in 1917 were the Nippon Seiko-Sho (Japan Special Steel Works) at Tokio, to manufacture special quality steels; the Toyo Seitetsu Kabushiki Kaisha (Oriental Steel Mfg. Co.); Nippon Seiko-Sho (Japan Steel Works) at Wanishi and Muroran, and the Tobata Chuko-Sho, Ltd. (Tobata Cast Iron Co.) at Tobata, Fukuoka Prefecture.

Three large companies were organized in 1918, the Nippon Denki Kaisho (Japan Electric Co.) at Koriyama in Fukushima Prefecture, the Nagasaki Seitetsu Sho (Nagasaki Steel Works), and the Iwaura Seitetsu Sho (Iwaura Steel Works), but the coming of the armistice in November caused total suspension of plans for their establishment. At this period the total investment in private enterprises in the steel industry was more than 500,000,000 yen.

Plants Built in Manchuria and Chosen

From 1914 to 1918 the Japanese steel industry began to reach out into Chosen and Manchuria. The Honkeiko Seitetsu Jo, Penhsihu, Manchuria, controlled by Japanese and Chinese capital, was established on the site of a former coal-mining company as a result of the discovery of iron ore deposits at Miaoerku about 24 miles distant.

In this period, also, the Anzan Seitetsu Sho of the South Manchuria Railway Co. was under construction at Anzan (Chinese: Anshanchan). This plant did not go into operation until after the war. The Anzan plant has two blast furnaces with a capacity of 300 tons a day each, the total rated output per year being about 200,000 tons of pig iron. The present plans of the company call for expansion to an eventual capacity of about 1,000,000 tons of pig iron annually, and in accomplishment of this it has just been announced that projected blast furnace construction will increase output to 500,000 tons. The first blast furnace was blown in at the end of April, 1919; the second furnace, with about the same capacity, followed at the end of February, 1920. The works employs a total of about 2300 Japanese and Chinese workers, including officials. In establishing this plant, a new town, with roads, water and sewage disposal systems, was constructed.

In Chosen there is one outstanding steel company, the Mitsubishi Seitetsu Kaisha (Mitsubishi Steel Co.) at Kenjiho, controlled by the Mitsubishi interests. The beginning of this company was in 1911, when the Mitsubishi company purchased the iron ore mine at Kenjiho in Kokai-Do. In May, 1915, a foundry was built, and in 1918 the first blast furnace was completed. Additional construction has given this works two blast furnaces with a total annual output of about 100,000 tons of pig iron, three 50-ton open-hearth furnaces with an annual capacity of 100,000 tons of steel ingots and 50 Wilputte coke ovens with a total annual capacity of 166,000 tons of coke.

In considering the Japanese iron and steel industry it is essential to realize that at present it is largely composed of "potential" capacity. The mills are established and equipment is available, although in some cases it is not entirely modern nor in the best of condition. The actual production of this industry is on a considerably smaller scale, hampered by financial difficulties.

Credit for much of the information in this article is given to T. Usami, Mitsui & Co., New York; M. Hara, commercial attaché to Japanese Embassy, New York; Economic History of Chosen, Bank of Chosen, 1920; Economic History of Manchuria, Bank of Chosen, 1920; *Japan Advertiser.*

More Pig Iron, Better Pig Iron, Protective Freight Rates

The Common Problems of Merchant Furnaces and the Foundry Industry

BY E. J. LOWRY*

THE NUMBER of blast furnaces in the United States has not materially changed in 1927. What has assumed real importance to the blast furnace industry are certain changes in furnace construction and equipment, plus the fact that users of pig iron have determined to ascertain the effect of various factors on the quality of the pig iron they are buying.

Steep Inwalls Successful in South

As to changes in construction, the most apparent is on furnaces working on southern ores. Steeper inwalls, water-cooled, permit a more uniform stock distribution with corresponding gains in tonnage produced, lower coke ratios, and a better working furnace. The steeper inwall gives a relatively larger area at the top, thus increasing the area for charging. The additional stock which may thus be introduced acts as a recuperator on the hot gases, which in turn makes a direct saving on the fuel consumed. Stock is better distributed by this wider area when southern ores are used.

Progress may also be noted in the construction of new gas washers, which increase the overall thermal efficiency of the furnace. In combination with this there is a trend toward drying the blast furnace gases. It was shown at the meeting of the Iron and Steel Institute at Glasgow, Scotland, that the value of the gas is increased proportionately by the use of silica gel for drying the air. This conference seemed to agree that by this method the Gayley process would be considerably bettered, and even though in American practice the latter had fallen short, the silica gel process would prove of great advantage to the blast furnace operator.

Does Large Tonnage Mean Inferior Iron?

Changes in blast furnace construction are made in order to give greater and greater tonnages per square foot of hearth diameter without any ill effect upon the quality of the product. The great fear of the consumer is that large production means a sacrifice in the quality of the pig iron—whenever there is great production the consumer immediately feels that iron and steel scrap in some form must have been added to the burden. In fact this topic has formed the basis of animated meetings held by the American Institute of Mining and Metallurgical Engineers, and the American Foundrymen's Association. As the result of the latter meeting a resolution was passed inviting other societies to join with the American Foundrymen's Association in an attempt to find out just what pig iron should be and how it should be judged.

As a result of this resolution experiments are to be conducted at various blast furnaces to determine the influence of construction as well as the influence of the type of burden on the quality of the resulting pig iron. If these experiments lead to definite conclusions they will doubtless have a great effect not only upon the construction of blast furnaces, but upon the sale of pig iron to the consumer.

At the present time there is no technical method to determine *quality* in pig iron. It is purely a matter of experience which determines the applications of various pig irons. Melters generally are not prone to investigate the results of any changes in the materials entering their mixtures; consequently accumulation of information has been slow. However, the western foundrymen have as a rule become able to judge an iron reasonably well, and are willing to pay premiums for certain characteristics, whereas (as will be indicated later) the Easterners must still be initiated into the vagaries of pig iron.

Special Irons for Special Purposes

Apart from these changes to be anticipated in the future, there has been a decided change in the pig iron market recently. Southern iron no longer travels in large tonnage into northern territories. The South has become a considerable factor in the consumption of its own foundry iron. Since the introduction of the centrifugal process for pipe casting the South sometimes faces an apparent shortage in this raw material and buys tonnages from the neighboring northern furnaces. Some authorities ascribe this condition to the high freight rate from the South to the North which forced industries requiring southern irons to move South; others attribute it primarily to the invention of the centrifugal casting process. It is probably more nearly correct to say that the growing South has made markets which absorb most of the pig iron made in that district.

The development of the centrifugal process has undoubedly had its influence on the Southern pig iron market, and it will have further effects upon blast furnace operations, due to the fact that centrifugal casting requires low carbon irons. Blast furnace men will be forced to find a way to meet the requirements of this situation. Inasmuch as there are English and German furnaces operating on this type of product it is reasonable to suppose that some American furnaces will accede to the demands. Other casting processes require high carbon irons from the blast furnaces. Thus it would seem that pig iron production will become a specialty and the energetic producer will naturally meet the specifications of his consumers. This trend is clearly shown in New York State, where certain furnaces have found that by sintering the ore they have been able to meet the requirements of the most exacting consumer. The same careful preparation of materials entering the burden, as well as unique furnace operation, has shown that furnaces in the Cleveland and

*Consulting metallurgist for Hickman, Williams & Co. and Witherbee-Sherman & Co.

E. J. LOWRY Is Well Known to Men in Iron Foundries, Since He Travels Almost Constantly, Advising His Firm's Customers on Their Troubles Ascribed to Pig Iron. He is an active member of the Mining Engineers, Steel Treaters, Foundrymen's and Society for Testing Materials. His foundry experience was at Watertown Arsenal and the Oliver Chilled Plow Works.

Chicago districts can well adapt their conditions to meet the requirements of the melter.

In New England the influence of brand names is fast passing. Where five years ago a buyer must know the brand and origin of a pig iron, today he is more keenly interested in the delivered price. In many instances he has gone to an extreme, just as the West had done five years before. It will perhaps take five years for the New Englander to become accustomed to do as his Western brother does, namely, to pay a premium for quality where it is justly deserved.

Slightly More Charcoal Iron Sold

Consumption of charcoal iron during 1927 will be found to be equal to that of 1926, if not greater. While the Charcoal Iron Co. of America passed into receivership, this had been anticipated, so there was no reaction felt in the market. Larger tonnage is estimated as the basis that the Wrigley charcoal iron furnace has been able to maintain operations continuously during 1927, as against an approximate six months' operation previously.

There is a growing tendency for foundry metallurgists to use charcoal iron in the production of fine castings.

High test cast iron will also have considerable effect upon the industry. Whereas cast irons of 28,000 lb. tensile strength were exceptional in past years, proper manipulation of materials has produced irons with strengths as high as 60,000 lb. Such high strength materials will be useful to the constructor and designer of modern machinery, and will enable the foundry industry to recover some of the market lost to rolled and forged steel. There is also the possibility that alloy cast iron will change the status of the foundries in this country.

Freight Rates Have Profound Influence on Furnace Activities

The freight rate structure on pig irons throughout the entire country is being contested. Furnaces in each district feel that they should have greater advantage when shipping to other districts, while those within such districts wish to prevent greater competition. The consumer, however, is hoping for this competition and wishes that greater tonnages were available for his selection.

This matter is of nation-wide importance because of its economic hearing on the world's largest industry. At times it may be forgotten that freight rates are a protection for furnaces within particular districts, which furnaces might otherwise be at a disadvantage owing to individual costs of production. During the past year the high-cost furnaces have been excluded from operation, but the medium-cost and low-cost furnaces have been fighting for business; without freight rate advantage the medium-cost furnace must necessarily have blown out.

On the other hand, the gray iron and malleable industries are well within their rights in demanding competition among pig iron producers. These branches of the foundry industry have not progressed within the last three years, mainly because of their operating costs. In order to meet competition from within and from without they have been forced to sacrifice earnings to keep in operation. Consequently they feel that a reduction in the delivered cost of raw materials might result in giving them a small profit. They now take business at cost or below, and try to break even or show a profit by using cheaper grade materials. Ultimately the engineer or the consumer finds that the product is inferior and discards it for forgings, stampings or some other material; the end result is that the foundry makes fewer castings, and the merchant furnace sells less pig iron.

A happy solution of the problem would be to district the country, and proportion freight rates to the distance in the districts, but this becomes an obvious impossibility when market conditions in each district vary with the supply and demand. The only agreeable outcome will follow when the consumer of pig iron sees that his object is the same as that of the producer. Their position is a common one, but neither has grown to understand the other's predicament.

Better Marketing Is Steel Need

Steel Sales Executives Discuss Impediments Encountered in Selling of Products at a Profit Commensurate With Large Capital Invested and Importance of the Industry

SEVERAL MEN prominently identified with the selling of steel have contributed to this issue, on invitation of THE IRON AGE, their views on the difficulties encountered in the marketing of steel products. Entirely aside from the ever-present operation of the supply and demand balance, it is frequently pointed out that there are many competitive ills for which a solution should be, but has not yet been, found. Some of the questions which our contributors discuss include:

Is the present form of steel contract a cause of market irregularity?

Would the situation be improved if steel were sold for specific requirements only?

Are the concessions usually granted to the large buyer an undermining influence on price structures?

If such concessions have become a fixed policy with many steel companies, what is the best method of handling the small buyer who often regards his tonnage as more important than do the mills and demands the lowest going price?

How can less-than-carload orders best be handled?

The problem stated in the last of the foregoing questions is now undergoing a test of the application of extras for small quantities, such as have been adopted by manufacturers of hot rolled bars, cold finished steel bars, wire nails and cold rolled strip steel. But not much progress has been made in solving some of the other problems of steel marketing, and, in the opinion of the president of an independent steel company, there is little hope of steadying the steel products market "until the steel fraternity learns that it does not pay for individuals to try to get more than their share of the business in slack times by cutting under and making unwarranted concessions in prices or terms."

"Let sales policies and prices recognize the right of the stockholder to a return on his money," says another commentator in reply to THE IRON AGE'S inquiry, while still another points out that it is the scramble for the extra 10 per cent of unprofitable tonnage that "becomes a formidable menace to the entire business." He adds: "Find a market for the surplus at a price which allows a profit and the solution of the problem will be close at hand."

Comments received by THE IRON AGE are in disagreement upon some of the issues raised, but all agree that there is a problem which demands wiser sales policies if steel production is to be placed on a basis of profit commensurate with the large capital invested and the importance of the industry. The comments which follow include a letter from the purchasing agent of a company which is a large steel consumer.

Laxity Has Developed in the Merchandising of Steel

"THE desire to bring about consideration of the difficulties in the matter of marketing steel products is certainly entitled to the support and careful consideration of all producers. There has developed a laxity in our merchandising that is to be deplored, and we have educated buyers to the point of freedom in consideration of any obligation that they may have to us as producers that makes the marketing of steel products something of a joke, if it were not so serious.

"Our problems, like all other problems, can be solved by going at them in the right way and with the right disposition. I could bring up a number of objectionable methods that should be eliminated, but they are only incidental. The real solution is this—we have brains in the steel business, unquestionably, otherwise the industry would not be of the size and caliber that it is; when the executives who control this industry start out earnestly and sincerely to merchandise steel products in a sound, legitimate way, that will guarantee a reasonable and regular profit, then it will not take long to put the industry on a basis just as efficient in the selling end as now exists in the operating end.

"The reason that we have been consistently becoming worse and earnings have been going down is because the big problems in steel merchandising have not had the attention and consideration of the executives, as have matters of finance, operation, transportation, etc. I am hopeful that the time is almost at hand when the situation will be improved, because the earnings in the steel business have become a matter of unfavorable comment, not only with our stockholders but with our bankers, and even with our customers."

Rights of Stockholders to Fair Return Have Been Ignored

"THE usual excuse for the sale of steel at or near its producing costs and sometimes below is that it is one of the economic evils growing out of the fact that the country's consumptive power is not yet equal to its productive capacity. I sometimes wonder if that is the whole story. Having been trained to the belief that the first obligation of every sales executive is to the stockholders of his company, who have provided the capital for the conduct of the business of the company and actually have made the management, including the manager of sales, a trustee of the investment, I cannot escape the conclusion that the query, 'What is wrong with steel selling?' is partly at least answered by the fact that the rights of the stockholders to a fair return have been ignored.

"There may be justification at times for the acceptance of a particular piece of business at a price that does not more than bring in a new dollar for an old one. It is costly these days to keep modern steel mill equipment idle, and getting an order that will provide at least partial operation may justify a temporary concession, especially if the concession means less loss

than would be entailed in complete suspension. But when profitless business continues to be taken, then it is time for the directors to make an investigation of the sales department.

"There is nothing particularly new in the condition that the productive capacity of the country exceeds its ability to consume steel; not only has that been true for the past six years, but short range buying which developed with the ability of the manufacturers to make prompt shipments at extremely short notice also has been a condition long enough for us to have accustomed and adjusted our sales habits to it. Though steel manufacturers have been laboring under this handicap for three or four years, practically no attempt has been made to add the extra cost of doing business in this fashion to the sales price. In other words, mills are transacting a jobbing business, which is forced upon them, without the remuneration which the jobber would demand for the same effort and service. Let sales policies and prices recognize rights of the stockholder to a return on his money and whether or not the country can make more steel than it can use will cease to have its unnerving effect upon sales managers and salesmen."

Says Contracts Should Be Fixed Both As to Price and Tonnage

"UNTIL the steel fraternity learns that it does not pay for the individuals to try to get more than their share of the business in slack times by cutting under and making unwarrantable concessions in prices or terms, I see no particular hope of steadying the steel products market.

"The present tendency to sell for periods of three months is a favorable factor in the marketing situation, as a consuming company ought to be able to measure its business with reasonable accuracy for such a period in advance. The inability to measure business conditions is the only excuse I know of for the instability of prices made and agreed upon between producer and consumer.

"There come times with certain companies that have to manufacture for long forward delivery and before conditions surrounding consumption have been determined that have led to the habit of period contracts, the only limitations being requirements, so as to enable the buyer to shift the burden to the seller by ordering very modestly if his business drops off and very heavily if his business improves unexpectedly or if the market price of the commodity he is buying advances.

"It would seem to be reasonable to expect that quarterly agreements be maintained at a fixed price and tonnage agreed upon just as securely as pig iron sales are maintained in both these respects.

"If there are occasions where the price of raw material for manufacture covering a long period is necessary to the buyer in order for him to be sure of his costs for future delivery and he therefore asks for a season's requirements, he should be compelled to divide the responsibility with the seller and state a minimum which he would under any circumstances take, with only a reasonable spread to a maximum which he might specify and receive if his business demanded.

"At the present time the favorable factor is the tendency toward short period agreements, which should more frequently than is now the case carry exact tonnage statements; and the unfavorable factor is the effort of certain producers to get more than their reasonable proportion of available business as related to their productive capacity, which results in demoralizing the market."

Firm or Binding Contracts Would Improve Steel Situation

"THERE is nothing wrong with the present form of steel contract; there is much wrong with the execution and enforcement of the contract. In a weak or declining market the average buyer at best considers the contract in the nature of an option and if he specifies or takes out the tonnage agreed upon he forces the seller to meet conditions or prices that did not exist when the contract was made; on the other hand, in a strong or advancing market the seller does not always religiously fulfill his agreement, and it is common knowledge that sellers often give preference to the higher priced or more desirable business. Both of these practices are unethical if not contrary to law but one will continue as long as the other.

"Under a firm or binding contract the situation would be much improved because contracts would be made only for specific requirements, or if made speculatively both parties would be prepared to take their loss as well as their gain. This is true in business generally, so it could be made to apply to steel contracts.

"It is the history of all business that is not controlled by statute as to its price or rate making that large or otherwise very desirable buyers usually obtain concessions which do not truly reflect what is commonly called the market price. It is my personal observation that the Class B buyer who aspires to be favored on a Class A basis is equally averse to having a Class C buyer placed upon the Class B basis. Such being the case, the only real solution is concerted action in the industry with classification and agreement as to the status of all buyers. This may be illegal under our present laws but if the practice is not followed openly it is followed in actual fact, and it is quite generally a recognized if not fixed policy.

"If concessions to the large buyer have become a fixed policy in the steel trade it is difficult to say what

is the best method of handling the small buyer who frequently regards his tonnage as more important than do the mills and demands the lowest going price. One who may be a small buyer to one seller may be considered of prime importance to another seller, and, in the absence of a price controlled market, difference of opinion will manifest itself most forcibly in distinction and discrimination in the classification and handling of all substantial buyers.

"In the handling of less-than-carload orders by the mills, it is not consistent to ship such orders at carload prices because of the additional expense and inconvenience involved. As to the question of less-than-carload shipment either by direct sales by mills or for the account of jobbing customers, the answer can be found only by cooperation between the mills and their customers. As an example I understand that steel pipe is rarely shipped from the mills in less than carload lots simply because the practice of carload shipments is established and is not deviated from on the slightest pretext as does occur in sheets, nails and other lines.

"In a general way the solution of any business problem lies within the industry itself, by which I mean both buyers and sellers, by cooperation on the part of all concerned, good faith in every transaction, with condemnation if not prosecution for violations of contract and unfair dealing. Let the buyer and seller both understand the nature of an obligation and then live up to it honestly."

Small-Lot Sales by Mills Blamed for Some of Industry's Ills

"THE major ills of the steel industry might be summed up in the one statement that we have 34,000,000 tons annual production of rolled products where 31,000,000 tons would suffice. The excess 3,000,000 tons must be "dumped" at a profitless price with the consequent disturbance of all price structures. Find a market for the surplus at a price which allows a profit and the solution of the problem will be close at hand.

"Under ordinary conditions approximately 80 per cent of any one year's production is actually bought for current consumption, and little effort is needed for its sale. Approximately 10 per cent is keenly negotiated for by both buyer and seller, the advantage shifting from one to the other as the immediate requirements of buyer or mill might dictate.

"The remaining 10 per cent, forced upon the sales department by the ambition of the operating department to hang up a new production record, becomes a formidable menace to the entire business. Almost frantic efforts are made to dispose of it. Numerous inexperienced salesmen are sent out to solicit from the smallest consumer, who will buy only as much as the particular job in hand requires. Frequently several such orders will total a scant carload, with the consequent higher cost of handling at the mill.

"At the risk of being classed as reactionary, I might suggest that the mills are not cooperating properly with the warehouses and distributers. Perhaps such cooperation holds the solution.

"These distributers are credited with handling about 10 per cent of the output of finished steel, or in the neighborhood of 3,000,000 tons annually. Assuming this amount of tonnage is sold from warehouse stock, it means a turnover of a stock of 1,000,000 tons three times a year. Stocks are always replenished and never completely depleted. Holding the stock in warehouses actually removes it from the market. Due largely to direct mill competition, warehouses today are carrying from 25 per cent to 50 per cent less stock than they have carried heretofore. This decreases their purchasing power, and affects directly the tonnage which might move in double-car shipments to warehouses. The mills are losing two to three tons of this desirable business for every one ton they are gaining from the small buyer, who should buy from warehouse.

"The steel industry as now organized and equipped should give careful thought to the question of retailing their surplus production. Perhaps it will be found expedient to abandon such retailing and turn it over to warehouses properly equipped to handle it, or they might find it desirable to equip their yards so as to handle such business on a profitable basis.

"When proper realinement of this question of mill and warehouse is effected, and when greater attention is given to executive sales effort, instead of the present method of getting an order by quoting or cutting prices and promising delivery, two great wrongs in the general plan of steel selling will be corrected."

Concessions to Large Buyers Soon Reflected in All Sales

"WHATEVER overproduction there is in steel plates is due to the fact that the mills in the East were equipped to take care of shipbuilding. The war put this out of business and consequently 50 per cent of our tonnage is gone. Nothing has ever come up to take its place, so you see it is not the mills' fault that there is over-capacity.

"If there is anything wrong with steel plate selling it is because there is so much competition. This is a direct result of the situation stated above.

"The present form of steel plate contract is a pernicious influence because it is nothing more than an option. In other lines of trade, such as pig iron, etc., a contract is a contract.

"The situation would be improved if steel were sold only for specific requirements. This, however, can be done only with those who use large quantities. The small buyer cannot write in and ask for a price every time he wants to buy 10 tons.

"Concessions granted to anyone are an undermining influence on price structures. It is such prices as these that get into the trade papers and which make the other buyers hammer the seller until they get the lower price. The writer does not believe that a special concession given to some buyer for a special reason is a market. It is not the market, but today a special concession in a very short time becomes the market. The small tonnage is just as important to the small buyer, and possibly more so than the special tonnage to the large buyer. I do not know how this is going to be corrected."

No Price Recognition of More Exacting Steel Specifications

"THE great error in steel selling, as I view it, is that there has been no recognition of the fact that since 1921 the industry has been making not steel the commodity, but steel the product, into which goes not merely the raw materials but all the expenditures of many years in research, experimentation and investigation that the finished product may do everything it was intended to do by those who have formulated the specifications.

"As is very well known, a large percentage of the total production of steel today is made to specifications. With machinery doing the work formerly performed by hand; with mass production the common practice of large steel consuming industries, there can be no deviations from the specifications as written by the engineers and metallurgists of these industries. The automobile manufacturer cannot afford to put a model upon the market that may come back upon his hands because the fender has yielded to the road shocks of the car in operation or the car develops other weaknesses be-

cause the steel has fallen below specifications. No longer can random lengths of bars or sheets of dimensions in excess of the design be shipped to automobile builders. There must be uniformity of length of bars and of sheet dimensions that they may go through machines and create no scrap waste.

"The steel industry has willingly met these and other precise exactions of consumers, but seemingly has overlooked in its drive toward big production and its efforts to please, that precision is expensive when allowable variations in chemical and physical properties have constantly been more finely drawn. Indeed, it seems that the mistake has been that the steel industry sales policies still are dominated by the customs in vogue when the manufacture of steel was a rule of thumb proposition rather than a very exacting science as it is today. We are definitely beyond the period when steel was sold according to whether it was hard, mild or soft, and we have got down to quarter fractions of these divisions and even smaller divisions on allowable tolerances. The cost of these reduced limits on both chemical and physical properties has not been passed on to the ultimate consumer, but has been absorbed by the manufacturers in their desire to get tonnage until the difference between red and black figures is almost as minute as the tolerances."

From a General Sales Manager

"I HAVE read an article in THE IRON AGE, issue of Nov. 24, by Saunders Norvell, president Remington Arms Co., which seems to touch some of the vital points in a general sales policy, and much of this article might be applied to the selling of steel. It is interesting to note what Mr. Norvell has to say under the head, 'Selling policies call for hard thinking higher up.'"

Steel Plate Contract Has Become Only a Loose Protection

"THE present steel plate contract is very unfavorable to the seller and it really means nothing more or less than a protection to the buyer. It is a hard matter, however, to get away from it, inasmuch as steel plates are very seldom stocked in any quantity, since carrying stock would entail a great deal more waste in preparing for fabricated jobs than there would be in the case of bars or structurals.

"It does seem funny that pig iron is contracted for as an absolute sale, but for years the plate contract has been nothing more or less than a loose protection and we certainly would welcome any move which would tend to change this situation.

"It is always possible to sell steel for specific requirements, but the unfortunate thing in connection with this is that in order to bid a man must know exactly what his material is going to cost him and, to the writer's knowledge, the matter of protection along these lines has been very much abused. The buyer may secure a protection on a certain tonnage to cover a particular job and then if he does not get this job but gets a few smaller ones, he can apply such tonnage against the protection granted, particularly if he has a very elastic conscience.

"As regards the small buyer, it undoubtedly costs the mills a lot more money to handle their business, but from the time hand-to-mouth buying originated, there has been such a scarcity of orders that there has been no trouble whatever for the smaller buyers to secure as good a price as we would quote the average large buyer. The one thing that we cannot condone is the fact that some of the larger companies insist on selling the car companies and others of that size at a price under the market at all times, and then these companies use the same prices in purchasing steel for uses other than cars.

"We feel that the less-carload business should be handled on a higher base than carload business.

"The writer recalls that during the war an executive of one of the largest companies in the country decided that he would see to it that a contract was made a contract and not simply a loose protection, but even in a period of such strenuous demand as we went through from 1915 to 1918, the steel contract continued to remain the same as it had previously been and unfortunately the same as it is today."

Problems of the Buyer Should Be Considered in Sales Policies

BY A PURCHASING AGENT

"THE present form of steel contract seems to be based on an appreciation of the problems confronting the industrial buyer at the present time, whereby he is unable to anticipate specific requirements any appreciable distance into the future. This situation is determined by the selling conditions which confront the organization of the industrial buyer and characterized by the attitude of the consumer who insists upon immediate or prompt delivery of the finished product.

"This attitude of the consumer is one phase of the prevailing policy of short term buying which has been opposed more stubbornly by the steel manufacturers than perhaps any other industry. I do not believe that the steel manufacturers can escape the disadvantages of short term buying any more than can any other lines of industry, and the present form of contract is in effect a recognition of this situation.

"The concessions granted the large buyer are a recognition of the fact that large volume purchases are entitled to better terms than the small-lot purchases. This is generally recognized in industry as being sound in principle and should not be an undermining influence on price structures. The fact that concessions to which the large buyer is legitimately entitled are sometimes extended to the small-lot buyer is not an argument against the plan of concessions to the large buyer, but rather an indictment of the selling methods of the steel industry.

"The question 'What is the best method of handling the small buyer' has apparently been taken in hand by the steel companies recently, as evidenced by the publication of differentials against small-lot orders.

"It is impossible to consider the question of selling methods as a matter distinct and apart by itself. The question of selling methods is involved with the other policies of the steel companies, such as their financial and manufacturing policies, and must reflect to a great degree the situation which obtains in these other departments of the steel organizations.

Buyer's Conditions Not Always Met

"To my mind the greatest handicap which the industrial buyer confronts in dealing with the steel manufacturers is their refusal to recognize the conditions which obtain in the industrial field whereby it is impossible in most cases to foretell specific requirements. The buyer insists that he must have immediate delivery of his requirements and the steel mill replies by sending out a printed schedule of rollings and expects the buyer to accommodate his necessities to the convenience of the mill.

"Compare, if you will, the service which a buyer purchasing equally large quantities of magnet wire and steel will receive on these two commodities. In

the case of the first item, he may arrange with the manufacturer to obtain his varying specifications from mill stock and at mill prices in approximately one-third the time required to obtain his steel specifications from the steel mill. In the one case the manufacturer will maintain ample stocks of the specifications which his customers ordinarily use and is prepared to furnish these promptly. The steel mill, however, persists in bringing up the question of rolling schedules and puts the burden of getting delivery upon the industrial buyer.

"At the present time the steel mills are giving unusual service on mill shipments, due to the fact that competition has shown them the wisdom of so doing. It seems entirely probable, however, that as soon as large volumes of business are available and the order books are reasonably well filled up that they will again be quoting rolling schedules to the industrial buyer rather than making a sincere effort to procure for him the deliveries which his situation requires.

"I should like to call to your attention also the propaganda appearing in some trade publications attempting to force the industrial buyer into the hands of the steel warehouse. If they are successful in this propaganda the buyer will be forced to obtain a large portion of his requirements from warehouse stocks at a considerably increased cost. I believe that these publications owe the industrial buyer an explanation of their attitude on this question.

"As to whether a steel contract should constitute a firm sale, the statement is made that in copper, brass, lead, zinc and other non-ferrous metals all sales are firm sales. This, in my opinion, is only partially true. As a matter of fact, the dealers in the non-ferrous lines and in pig iron are found to be as considerate and willing to extend cooperation to the buyer as in any other line. I have yet to learn where buyers have been forced to take material on such contracts where it is not to the best interests of both parties concerned to do so.

"Steel industries, perhaps more than any other, are complaining of the results of present competitive conditions, although I know of no reason why they should expect to be exempt from the effects of such conditions any more than other basic industries.

"No doubt the managements directing the affairs of the steel manufacturers, characterized as they are by the greatest ability, are studying all ways and means of meeting this situation. It seems to me it would be more helpful to direct their attention to a study of the buyer's situation, and I speak especially of the industrial buyer, and endeavor to cooperate with him and assist in meeting the conditions with which he is confronted, rather than to attempt to make his situation more difficult by more stringent contract regulations, insisting that he wait on rolling schedules or forcing him into the hands of the steel warehouse."

Exports and Imports of Metal Products

Iron and Steel Most Important in Exports, but Only One-Ninth of the Imports, Which Are Dominated by Non-Ferrous Metals

BASED on dollar values exports from the United States of iron and steel products for the first seven months of 1927, at $146,151,000 represent about seven times the imports, which aggregated $21,519,000. These figures, together with those for non-ferrous metals, are shown in the table, which gives also corresponding comparisons for 1926. It will be noted that the export movement this year has increased about 6 per cent over last year, nearly all of the gain having been in non-ferrous metals. The import movement has fallen below last year to the extent of more than 8 per cent, about half the drop having occurred in non-ferrous metals.

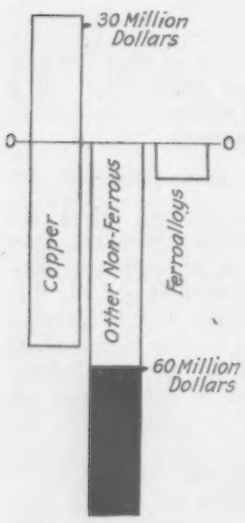
Semi-manufactures of iron and steel covered by the Department of Commerce compilation include pig iron, scrap, semi-finished steel, bars and rods, plates, sheets, including galvanized, strip steel, tin plate, etc. Manufactures of iron and steel include beams, fabricated plates, metal lath, rails and joints, pipe and tubes and fittings, including cast iron pipe, wire and its manufactures, nails, bolts, etc., and castings and forgings. Advanced manufactures include cutlery, hollowware, enameled ware, metal furniture and fixtures, stoves and furnaces, tools (cutting and other), hardware (builders' and others), chains, needles, scales and balances, screws, etc.

Of the non-ferrous exports, about two-thirds in each year was represented by copper. Of the non-ferrous imports the largest item, which covered about 40 per cent, was in tin bars, blocks and pig. More than two-thirds of the remainder consists of copper, mostly in the unrefined state, including ores and concentrates. Aluminum metal, scrap and alloy accounted each year for about 7 per cent of the non-ferrous imports and lead, mostly the ore, for a like quantity.

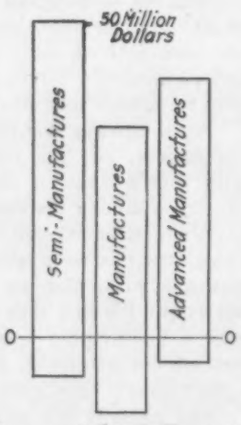
UNITED STATES EXPORTS AND IMPORTS OF METALS AND METAL MANUFACTURES
(In Thousands of Dollars)

	Exports		Imports	
	1927†	1926	1927†	1926
Iron ore	1,587	1,465	3,646	3,368
Iron and steel:				
Semi-manufactures	56,114	50,686	6,073	11,129
Manufactures	45,427	48,103	11,779	9,880
Advanced manufactures	44,610	44,694	3,667	3,869
Ferroalloys	590	461	9,243	13,857
Non-ferrous metals*	125,060	113,436	151,269	160,702
Total	273,388	258,845	185,677	202,805

*Not including precious metals.
†Seven months ended July 31.



(At Left) Excess of Exports of Copper Over Imports Is Shown Above the Zero Line, Total Imports Being Below. Likewise, total imports in the other columns are plotted below the line, with exports shown in black and excess of imports in white



Excess of Iron and Steel Exports Over Imports Is Shown Above the Zero Line, Total Imports Being Below and Total Exports the Entire Height of Each Column

New Records Last Year in World Iron and Steel Output

Iron at 84 Million Tons Exceeds Pre-War for First Time—Steel Reaches 98 Million—Expansion in Europe a Feature —American Proportion Falls

TWO new records were made last year by the world's iron and steel industry. For the first time since the war, pig iron production exceeded that of 1913. *At* 84,280,000 *gross tons it was about* 8.5 *per cent in excess of the* 77,720,000 *tons made just before the war. Steel output rose to* 98,200,000 *tons or* 7 *per cent larger than the best previous record in* 1926 *of* 91,790,000 *tons.*

The feature of these records is that they were made in spite of the fact that the American output of both pig iron and steel fell below that of 1925 *and* 1926.

Exports of the leading nations also made a new record last year, exceeding for the second time the pre-war volume.

European Recovery Chief Cause of Expansion in Output

GRADUAL recovery of the European steel industry from the effects of the war is the feature of an analysis of figures compiled for the world's pig iron and steel output. Based on data published and furnished by the National Federation of Iron and Steel Manufacturers of London, England, as found in the accompanying tables, the pig iron and steel production of 21 countries reached new heights.

With estimates made for the last month or two for the leading producing countries, the world's estimated pig iron output was about 84,280,000 gross tons, exceeding for the first time the 77,720,000 tons made in 1913. It was also 8.5 per cent more than the 77,670,000 tons made in 1926, which just fell short of the pre-war production.

In steel a new world record was easily achieved—approximately 98,200,000 tons or about 7 per cent larger than the 91,790,000 tons made in 1926 which was a record. The strides made in steel are demonstrated when it is realized that the 1927 steel production is about 31 per cent larger than the pre-war or 1913 output of 74,830,000.

More Steel and Iron Made in Europe

If the record of the five leading European countries —Great Britain, Germany, France, Belgium and Luxemburg—is studied, it will be found that the expansion in 1927 over 1926 was notable. In pig iron these countries are credited with 35,670,000 tons last year against 27,110,000 tons in 1926, a gain of nearly 32 per cent. In steel the same countries made 38,410,000 tons last year as compared with 29,580,000 tons in 1926, an expansion of about 30 per cent.

Taking all European countries, both the pig iron and steel output was approximately 10,000,000 tons larger than in 1926. Pig iron last year at 44,220,000 tons was 52 per cent and steel at 50,110,000 tons was 51 per cent of world total.

Outstanding in this expansion is the record of Germany and Great Britain. The forward strides of Germany last year were notable and surpass those of any other country. Both pig iron and steel production in 1927 increased from 30 to 35 per cent over the 1926 volume.

In Great Britain the recovery from the poor record of 1926 has been due to the settlement of the coal strike which nearly paralyzed the industry in 1926. Even at that, the showing is not strikingly better than in some years since the war.

In judging the European recovery as a whole, mention should be made of Russia. In that country rapid progress has been made so that the output of both pig

Table of World Production of Steel Ingots and Castings in Millions of Gross Tons

Country	1913	1923	1924	1925	1926	1927*
United Kingdom	7.66	8.48	8.20	7.39	3.60	9.17
Germany	17.33	6.20	9.68	12.00	12.15	16.09
France	4.61	5.03	6.79	7.33	8.30	8.09
Belgium	2.43	2.26	2.83	2.51	3.32	3.64
Luxemburg	1.31	1.18	1.86	2.05	2.21	1.42
Saar	...	0.98	1.45	1.55	1.71	1.85
Russia	4.76	0.71	1.12	2.11	3.08	3.48
Poland	...	1.11	0.67	0.77	0.78	1.35
Sweden	0.58	0.27	0.49	0.47	0.49	0.48
Spain	0.30	0.47	0.53	0.57	0.68	0.70
Austria	2.59	0.50	0.37	0.46	0.35	0.50
Hungary		0.28	0.24	0.23	0.20	0.21
Czechoslovakia		0.98	1.33	1.48	1.55	1.60
Italy	0.92	1.12	1.34	1.76	1.75	1.53
United States	31.30	44.94	37.93	45.39	48.29	44.50
Canada	1.04	0.88	0.66	0.76	0.78	0.87
Australia	...	0.20	0.31	0.35	0.35	0.42
India	...	0.22	0.34	0.45	0.52	0.55
Japan	...	0.97	1.11	1.32	1.48	1.55
China	...	0.20	0.20	0.20	0.20	0.20
Total	74.83	76.98	77.45	89.15	91.79	98.20

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.

Table of World Production of Pig Iron in Millions of Gross Tons

Country	1913	1923	1924	1925	1926	1927*
United Kingdom	10.26	7.44	7.31	6.26	2.46	7.32
Germany	16.50	4.86	7.68	10.01	9.50	12.87
France	5.13	5.34	7.57	8.36	9.28	9.13
Belgium	2.45	2.11	2.80	2.50	3.35	3.69
Luxemburg	2.51	1.38	2.12	2.33	2.52	2.66
Saar	...	1.00	1.37	1.43	1.61	1.74
Russia	4.49	0.52	0.74	1.53	2.40	2.92
Poland	...	0.51	0.33	0.31	0.32	0.57
Norway	...	0.03	0.06	0.08	0.08	0.09
Sweden	0.73	0.30	0.53	0.45	0.49	0.47
Italy	0.43	0.27	0.34	0.50	0.50	0.51
Austria	2.34	0.34	0.26	0.37	0.37	0.40
Hungary		0.12	0.11	0.09	0.19	0.20
Czechoslovakia		0.80	0.97	1.28	1.07	1.15
Spain	0.42	0.39	0.49	0.46	0.50	0.50
United States	30.97	40.36	31.41	36.70	39.37	36.40
Canada	1.01	0.91	0.62	0.60	0.80	0.73
Australia	0.04	0.33	0.42	0.44	0.40	0.41
India	0.20	0.61	0.88	0.89	0.90	0.91
Japan	0.24	0.80	0.82	0.91	1.16	1.20
China	...	0.49	0.37	0.38	0.40	0.41
Total	77.72	68.91	67.20	75.88	77.67	84.28

*Partly estimated. Lorraine's output is included in Germany's in 1913, but in that of France since 1918.

iron and steel in the last two years, and particularly in 1927, has reached about 75 per cent of the pre-war or 1913 volume.

France, Belgium and Luxemburg just about maintained last year, as a whole, the rates achieved in 1926.

American Outputs Fall Off

In the United States no new records were made. Conditions are reviewed in some detail on other pages. In pig iron, with an estimated output of about 36,400,000 tons last year the American total was about 43.3 per cent of the world total as compared with 50.7 per cent in 1926. In steel the probable 1927 output of 44,500,000 tons was about 45.3 per cent of the world total as against 52.9 per cent in 1926.

A tendency which has been quite marked since the war—the production of more steel than pig iron—is again a feature this year. In 1913 world pig iron production exceeded steel by 2,890,000 tons. In 1927 steel surpassed pig iron by 3,920,000 tons.

Table of Steel Exports and Imports of Leading Countries in Millions of Gross Tons

Exports	1913	1925	1926	1927*
United States	2.89	1.68	2.06	1.96
Great Britain	4.97	3.73	2.99	4.22
Germany	6.20	3.21	4.82	4.24
France	0.58	3.86	4.13	5.67
Belgium	1.55	3.15	3.71	4.50
Total	16.19	15.63	17.71	20.59
Imports	**1913**	**1925**	**1926**	**1927***
United States	0.25	0.84	1.02	0.67
Great Britain	2.23	2.72	3.74	4.38
Germany	0.30	1.18	1.03	2.25
France	0.17	0.17	0.18	0.13
Belgium	0.87	0.53	0.60	0.63
Total	3.82	5.44	6.57	8.06
Export excess	12.37	10.19	11.14	12.53

*Partly estimated. Luxemburg included in Belgian total.

World Using More Steel, Exports Indicate

JUDGED by the exports of the six principal steel exporting nations, world consumption of steel attained a record volume in 1927. For the second time since the war the total was larger than that of 1913. One of the tables gives the details. At 20,590,000 tons world exports exceeded those of 1926 by 2,880,000 tons or 16 per cent. Compared with 1913 the 1927 total was 4,400,000 tons, or nearly 27 per cent larger.

Imports into these six countries were the largest last year ever recorded at 8,060,000 tons, easily exceeding those of 1925 and 1926 and over twice the total of 3,820,000 tons in 1913. Scrap is not included in these data.

The significant feature of the data is the fact that the excess of exports over imports of 12,530,000 tons in 1927 closely approximates the excess of 12,370,000 tons which prevailed in 1913. This would seem to indicate that the world's consumption of steel, particularly that of the non-producing nations, is now more nearly normal than at any time since the war.

One or two trends in both the exports and imports are worthy of mention. The commanding position of France as an exporter is notable—at 5,670,000 tons last year her foreign trade was nearly tenfold that of 1913 and easily led all other nations. Belgium's expansion was large last year and the British industry recovered from the effect of the 1926 coal strike. American exports were the smallest and are still less than before the war.

In imports the heavy inflow into Germany last year and the constant growth in the British receipts are prominent.

The 1927 record of both exports and imports evidently points to a greater interchange among all nations and a healthier economic condition the world over.

Coal Trade Depressed by Large Stocks and Low Demands

Strike of Union Miners Has Caused Scarcely a Ripple and Indications Point to Further Inroads on Organization's Strength

BY A COAL TRADE AUTHORITY

ABNORMALLY large stocks in the hands of consumers and a notable falling off in industrial demand combined to depress the bituminous coal market at the close of 1927 almost to the point of demoralization. The unusual situation with regard to stocks is the result of the extraordinary reserves built up in the first quarter in preparation for a nation-wide strike of union soft coal mine workers and the failure of the strike to produce the expected coal shortage.

The Government estimated that 75,000,000 tons of coal were in consumers' storage piles when the strike was called and reported more than 60,000,000 tons as yet in reserve on Oct. 1. The strike caused hardly a ripple in the coal market, and throughout the year demand, not labor, was the factor limiting coal production. Non-union output has steadily gained in volume as one area after another cast off the union and put its production on a competitive basis with the great open-shop fields of the South.

Western Pennsylvania followed northern West Virginia. Central Pennsylvania and Ohio were the next large fields to declare for the open shop and wages below the Jacksonville scale. The United Mine Workers draws revenue now only from the anthracite miners and checkoff from Illinois and Indiana and scattering small districts in the middle and far West. Recognition by the union that much valuable territory has been lost is betrayed by the anxiety of the union leaders to force a meeting with these operators.

Large Stocks and Low Prices May Continue

With stocks on Jan. 1 probably in excess of 50,000,000 tons, prices averaging below $2 and demand for less than 10,000,000 tons per week, there is no prospect for early return of prosperity in the soft coal fields. There is no indication that a boom will appear sufficient to tempt operators to abandon their program of reorganization on a non-union basis in favor of temporary profits. Thus another year may surely be expected to record still further inroads on the union's hold and even larger percentages of non-union production of bituminous coal.

Production of around 520,000,000 tons of soft coal in 1927 established no new record. Shipment of nearly 33,000,000 tons of Lake cargo coal is a new high point, however. Exports overseas were below normal. With no threat of shortage or higher prices hanging over the industrial users' heads there can be no gain in production until stocks are liquidated and demand, particularly that of the iron and steel industry, picks up.

Marked Progress in Non-Ferrous Metallurgy Last Year

Expansion in Chromium—New Uses for Nickel —Aluminum in Lighter Transportation—Electrolytic Zinc on the Horizon—More Copper Used

BY W. M. CORSE*

IT is becoming increasingly apparent that the high average of prosperity in the field of non-ferrous metallurgy is being maintained, to a great extent, by the pursuit of research and sales development methods.

Copper—*Advantages Broadcast*

THE copper industry, through the Copper and Brass Research Association, reports that the advantages of using copper, brass, bronze and other copper alloys are being more widely recognized every year. Where formerly one person was aware of the economy and advantage of using copper or its alloys, now the general public is better acquainted with their merits.

In this survey of the copper field during the past year, improvements of materials already existing and an increase of their use has been closely followed by some new uses. Brass pipe has shown a decided increase in consumption. Charts show that it has maintained for the past three years an average yearly increase of 76 per cent, and a total increase since 1923 of approximately 228 per cent. Municipalities and water companies are turning to copper, thin-walled tubing and brass pipe for service installations. The radio industry continues to consume large quantities of copper and its alloys, as does the automobile industry. Farmers are turning to copper for lightning rods, and this is a growing outlet. The building industry depends more and more on copper products where economic, lasting and beautiful installation is desired. From roof to cellar it finds its place. Copper and brass radiators are coming into favor, and a relatively new and growing market is the household refrigerator.

Lead—*No Spectacular Progress*

THERE have been no spectacular developments in lead during 1927. Continued research has resulted in the production of a soft paste white lead of high quality which will reduce costs by lowering the time and labor required for mixing. This is a considerable item when one takes into account the wide and growing use of paints of all kinds.

One use for lead which is attracting considerable attention is its appearance in the composition of lead mattresses that act as shock absorbers to neutralize vibration, especially in sky scraper construction on rock foundations. These were used experimentally by architectural engineers about 1917, and the results have been so satisfactory that lead mattresses were used in the new Graybar Building in New York, and have been specified for the new union station in Buffalo.

In other branches of the lead industry progress has continued along well established lines.

Zinc—*New Processes and Alloys*

THE main development in the high zinc alloy field last year was that of a zinc base magnesium-bearing alloy designed principally for die casting.

The use of the metal in the slab and wrought form has continued in the industries as follows: 47 per cent for galvanizing; 29 per cent for brass and other copper and nickel alloys; 14 per cent for rolling, and 10 per cent for miscellaneous purposes.

In the electrolytic field, the Bunker Hill & Sullivan Mining Co. at Kellogg, Idaho, is erecting a new electrolytic plant at which the Tainton process will be employed. This differs from existing plants in the method of solution and purification, and the use of much higher current density, which gives heavier deposits and materially decreases the size of the plant. The Anaconda Copper Co. is building an additional plant at Anaconda, Mont. Both of these are expected to be in operation in the early part of this year.

The retort method carries on in the old manner. Several companies have added sintering equipment which has materially improved their recoveries.

In England, the Coley process, a pyro-metallurgical reduction in a rotating furnace; and the Ashcroft pro-

*Metallurgical engineer, 810 Eighteenth Street, Washington.

cess, a pyro-electrolytic reduction in which molten zinc chloride is electrolyzed after being produced from zinc chloride and chlorine at elevated temperatures, are being operated in semi-commercial plants.

In Germany, the Waelz process, a fire concentration of low grade zinc material in a rotating furnace, has been installed in several commercial plants, while one plant is being erected in the United States.

Nickel—*New Outlets Developed*

A REVIEW of the nickel situation would seem to indicate that nickel has not only maintained its general high average in existing usages, but is finding new outlets in unsuspected directions.

It was believed that the development of chromium plating, which took a leap forward with the clearing up of the patent situation, would react unfavorably on nickel plating, whereas the contrary was the case. It developed in practice that chromium, plated over nickel plate, resulted in a more lasting product.

Monel metal, the well-known high-nickel alloy, reached out into an entirely new field of usefulness. This alloy, which is remarkable for its color, closely resembling pure nickel, and for its resistance to corrosion and abrasion, is being increasingly used in existing fields including dairy equipment, hotel kitchens and cafeterias—where it is used for table tops, cooking utensils, boilers, etc.—as well as in the new use first mentioned in this review last year, as traffic markers to replace the lines of white paint which have become necessary for marking traffic lanes in congested city streets. The increasing cost of maintaining painted traffic lines has resulted in a search by officials for something to lower costs and yet remain as efficient and as noticeable as the lines painted on the pavements.

Development of solid nickel-silver plumbing fixtures and equipment has made considerable progress during the past year. The advantages of a solid metal for fixtures, where future replacement costs must be kept at a minimum—such as hospitals, government buildings, etc.—is becoming recognized as not only desirable but necessary. Solid nickel-silver, with a 20 per cent nickel content, retains the color of pure nickel and no amount of polishing will take off the coating and show a different colored base, because solid nickel-silver is exactly what its name implies—solid throughout. It appears in the list of standard specifications for plumbing fixtures of the United States Government; it has had considerable use in naval hospitals and other public buildings throughout the country during the last year, and has been specified in connection with the monumental building program of the Government in Washington.

There is no question that the large amount of technical information furnished by the manufacturers of nickel has been an effective contributing cause of its growing use in established fields, and its introduction into new ones.

Aluminum and Magnesium—*Uses Expanding*

THE most interesting development in the aluminum industry for 1927 was the introduction of Alclad, a new aluminum sheet. Its application is indicated where strength and corrosion resistance are of major consideration, and it promises to be particularly useful in the manufacture of airplanes. Alclad consists of a heat-treated aluminum alloy base, with a smooth, dense, non-porous surface of very pure aluminum of uniform thickness alloyed and integral with the core, and it combines the corrosion resistant properties of pure aluminum on the surface with high strength and stiffness. Exhaustive corrosion tests show that these composite sheets are many times more resistant to moist air and salt spray than the unprotected strong aluminum alloys.

The use of aluminum sheet continues to gain in favor in the transportation field where the trend is distinctly toward weight saving. The strongest trend in this direction was experienced during the past year, and November marked the completion of 32,000 miles regular service of an aluminum car on the lines of the Cleveland Street Railway. This car weighs 30 per cent less than the same car in steel and over a 10-month period has shown a saving of 22 per cent of the power required to operate a steel car of similar capacity. A careful inspection was recently made and every aluminum part was found to be in perfect condition.

The Chicago & Joliet Railway, the Illinois Central, the Chicago & Northwestern Railway Co., the Alton and the Southern Railroads are a few that are installing cars constructed of aluminum in so far as possible.

Trend Is Lighter Weight in Transportation

This modern trend toward lighter weight in transportation of all sorts gives many advantages. A lighter train, or street car, or bus has more rapid acceleration and deceleration. This means less power for operation. With quicker starts and stops shorter running schedules can be established and maintained. Light weight means less wear and tear on the vehicle itself as well as on the track or highway. An especial advantage in the case of street railroad equipment lies in the markedly quieter operation of light weight cars.

During 1927 it has been demonstrated that structural shapes can be rolled from aluminum strong alloys in lengths of 80 ft. or more. Two special types of sheet for radio condensers were produced during 1927—these are of particularly high grade, rolled to the closest tolerance both as to gage and flatness, to permit fabrication of the most efficient variable condensers. A new top-down aluminum shingle was put on the market during the past year. The chief advantage of this shingle lies in its construction which permits it to be applied commencing at the ridge of the roof, successive rows being added moving down toward the eaves until the whole roof is covered. These can be applied at a labor cost of 50 to 70 per cent of that for other types of roofing materials. Aluminum nails have also been introduced and it is now possible to supply a complete aluminum roof and gutter job.

The existing uses of aluminum and its alloys showed increase in practically all instances. Aluminum foil, which is rapidly supplanting pure tin and composition foils, has increased in use 150 per cent during the past two years, and aluminum bronze powder as a paint pigment has taken its place with the older and more commonly known pigments. Sales of aluminum collapsible tubes have doubled over those of 1926, and 700,000 lb. of rod was used in the manufacture of screw machine products last year.

Magnesium—Expansion in Established Uses

There has been a gradual improvement in this field which has taken the form of increased uses for already established applications rather than the discovery of new uses. The sales of ingot have gained ground be-

cause of increased knowledge of the strong deoxidizing power of magnesium, and magnesium is being used in increasing quantities in high strength aluminum alloys.

The production of magnesium alloy castings has greatly increased. Parts for aircraft engines such as gear case cover, housing, etc., continue to call for increased poundage. The use of magnesium castings for aircraft engine starters has just about doubled during 1927. Aside from aviation, there is an increasing call for magnesium castings in such applications as textile machinery, the moving picture industry, etc.

The sales of magnesium wire and ribbon remain about on the same level, with the radio tube business taking the largest amount of the production. A 99.98 per cent purity is still demanded by this industry. Magnesium powder is being produced in larger quantities. In 1927 the increase will probably be approximately 25 per cent over that of 1926.

Chromium—*Two General Trends of Development*

DEVELOPMENTS in the use of chromium have gone on in two general directions: One, a wider recognition of the properties it confers on low-carbon steels for some interesting engineering applications, and the other, an expansion of the applications for the high-chromium alloys, particularly in the corrosion resistant fields.

The former trend is obviously one in line with an even more general movement, that is, the recognition of a new principle in engineering steels—the raising of alloying content and the drop in the carbon content. By means of such an adjustment, the hardness (tensile strength) formerly obtained by carbon, is now developed by the presence of the alloying elements, but with this essential difference, the increase of hardness is *not* at the expense of toughness, since the latter essential property is actually enhanced by the proper balance of alloy and carbon content.

Most convincing evidence of this revolution is to be found in many marked examples. Witness the acceptance of the so-called silicon steels in ever increasing proportions in important structures, notably some new central station construction and two of the largest suspension bridges. Chromium is able to take its place in this advance by virtue of the fact that its quality of strengthening and toughening (with proper carbon content) is extended throughout the cross section of the member.

With respect to the high-chromium alloys, the use of the nickel-chromium compositions of austenitic range seems to be coming into more general favor. This is a natural sequence because of the combination of cold working properties with more inclusive resistance to corroding media. These remarks on the nickel-chromium compositions apply particularly to the extension of chrome-iron alloys in the chemical industries; in the straight rust resisting uses the rustless irons still hold sway, with the tendency to keep the chromium content above 14 per cent.

Chromium Plating Expands

The use of chromium plating has advanced rapidly during the past year. Its use may be expected to increase at a still faster rate as a result of the consolidation of most of the important patents in the United Chromium Corporation which will enable the various licensing companies to institute a more active development program.

The element silicon is rapidly being used in many new ways. Its application in steels for alloying purposes was mentioned above; in the non-ferrous alloys its effects have been capitalized and the past year has witnessed research in several fields of non-ferrous alloys. Much remains to be done in investigation of what will probably result in improvement of brass and copper alloys by means of higher silicon content.

Cadmium plating, because of its superior rust resisting properties, is being applied more and more generally in industry. In view of the growing appreciation of the necessity for rust prevention, a rapid increase can be predicted for the use of this type of plating.

In the short space permitted it has not been possible to give a complete picture of the developments in any one industry. It has been possible only to point out the outstanding developments.

AWARDS HARRIMAN MEDALS

Schwab Praises Safety Work of Railroads in Annual Presentation

That the conduct of industry involves not merely the efficient direction of machines, but primarily the guidance, the protection and the promotion of human beings, was brought out by Charles M. Schwab in an address before the American Museum of Safety in New York on Dec. 28. The occasion was the presentation of the E. H. Harriman Memorial Medals and special certificates to railroads for safety and accident prevention work in the year ended Dec. 31, 1926.

"Amazing progress has been made," said Mr. Schwab, "in bringing about efficient and economical production. The modern scientist has enabled us to manipulate machines through his penetration for us into the secrets of chemistry and physics. But the transcendent machine is the human being, the man with feelings, with sensibilities, with hopes and fears and responsibilities. It is the human being of whom we are thinking more than ever today, and the business man is a poor manager whose primary thought is not to bring about a fuller life and a finer existence for the human beings with whom he comes in contact."

Calling attention to the promotion of healthy rivalry among railroads in attaining safety which has been brought about by the American Museum of Safety, Mr. Schwab explained that the Harriman Memorial Medals are presented annually to the Class I steam railroads which, in their respective groups, have done the most during the year to secure progress in safety and accident prevention.

The gold medal was awarded to the Norfolk & Western Railway, which in 1926 showed a reduction of 28 per cent in the number of persons killed, as compared with 1925, and of 15 per cent in the number injured. The silver and bronze medals were awarded to the Duluth, Missabe & Northern Railway and the Quincy, Omaha & Kansas City Railroad respectively, both of which had records of no passengers or employees killed during the year.

California Firm Gets Airplane Order

WASHINGTON, Jan. 3.—The Navy Department last week awarded a contract to the Douglas Co., Santa Monica, Cal., for 25 PN-10 type airplanes, with spare parts and drawings, at a total cost of $1,553,505. The planes will be equipped with two air-cooled engines of 500 hp. each, of either the Pratt & Whitney or the Wright types. The department also awarded a contract to the Hall Aluminum Aircraft Corporation, New York, for one Type-V plane, with design information, miscellaneous data and drawings, at a total cost of $131,612. This plane will be powered by twin air-cooled engines of 500 hp. each.

Copper, Tin, Zinc Markets Reviewed

Authorities in the Trade Survey Course of Production, Stocks and Prices Last Year

REVIEWS of three important non-ferrous markets for 1927 have been written by men whose standing in the trade lends authority and interest to what they have to say. While copper is not as closely associated with the making of steel products as are tin and zinc, its importance in industry is large. The relation of all three to the economic life of the country is a commanding one and the following brief summaries are presented as of vital interest.

Copper Market Has a Bright Future

BY H. M. BRUSH*

SO far as the copper market is concerned, the year 1927 was divided into two nearly equal parts.

The first half of the year was a period of pessimism and declining prices; the second half of the year was a period of optimism and rising prices.

The refinery price for copper on Jan. 1, 1926 was 13.025c. per lb. There was a gradual, but quite persistent fall to a low of 12.175c. per lb. on June 20. This radical fall was due to a variety of causes:

1—An unwarranted increase in the production which started in the autumn of 1926.
2—Fear of a business reaction in the United States.
3—Skepticism on the part of Europe which resulted in their reducing their stocks of visible copper, thereby supplanting American primary production to a corresponding extent.
4—Hand-to-mouth buying by both European and American buyers carried to greater lengths than ever before, thereby resulting in a decrease in the invisible supplies of copper which it is impossible to estimate, but which we know to have been in substantial amount.

Shortly after July 1 figures assembled by the American Bureau of Metal Statistics indicated that production was again being reduced because of the low price of copper, and there were many evidences that consumers had run their stocks down to a point where they would shortly be forced to buy irrespective of their opinion of the market.

The average refinery price in June was the lowest of the year, namely, 12.37c. per lb. The price has increased since then first gradually and in the last two months rapidly to its present level of 13.75c. per lb.

Production for the year 1927 would seem to have increased about 3 per cent over production for 1926, which was the record year for the copper industry. This increase is less than a normal increase and has resulted in a decrease in the world's visible stocks of probably 50,000 tons. Stocks of copper are now rather below a proper level than above it. There would seem to be no danger in this situation, however, because of the possibility of increasing production should the consumptive requirements of the world demand a greater output of copper.

The formation of the Copper Institute in 1927 will, it is hoped, be as long a step forward for the copper industry as was the formation of Copper Exporters, Inc., in 1926. The Copper and Brass Research Association is continuing its splendid work in advertising copper to the ultimate consumers. The American Bureau of Metal Statistics is continuing its thorough statistical survey of world production and consumption. Copper Exporters, Inc., through its selling organization in Europe and its office staff in New York, is fully and currently posted as to conditions in the copper market outside of the United States. The Copper Institute is preparing to compile detailed and current figures as to production, cost of production, consumption and sales data in America.

With all this information at last available it will be a sorry commentary on the ability and vision of copper producers of the world if they insist upon producing their product, which is a wasting asset, in quantities so much greater than the consumers of the world are using that prices will be forced down to a level where any considerable portion of the production must be sold at less than its cost.

*Vice-president in charge of sales, American Smelting & Refining Co., New York.

Tin Prices Not Likely to Decline Much

BY JOHN P. WILSON*

FROM a market standpoint, tin did not do so badly during the first half of 1927, but began to react in July and August, and by early November had hit the lowest level since June, 1925. Among other reasons for the decline in price, the most important were a falling off of about 5000 tons in American deliveries and increased shipments from the Straits of somewhere between 4500 and 5000 tons.

These figures on their face are obviously bearish, but no evidence has been found of hidden supplies held off the market, and as the visible supply at the end of this year was likely to show little if any change as compared to Dec. 31, 1926, it seems probable that consumption in other countries must have absorbed not only increased production in the Straits but from other sources of supply. The *Mining Journal* of London recently computed that world supplies in 1927 were increasing at the rate of 1000 tons per month. If this is true, it would seem wise to look back a few years and try to view the situation as a whole, and get a better perspective from which to judge the future.

A fact often overlooked, but familiar to students of tin figures, is that the official statistics issued each month by the metal exchanges in London and New York do not truly picture current production and consumption. For about three years past the tin content of ores produced in Bolivia, Cornwall, Nigeria and South Africa, has annually exceeded 40,000 tons, but less than half of it comes into statistics under the caption of "Standard Supplies." Practically all of it is smelted in England and Germany, but the smelters

*Metal broker, 111 Broadway, New York.

do not make public the tonnage produced or quantities shipped by them to consumers in Great Britain and the Continent of Europe, so they also fail to appear in the figures of monthly deliveries. This failure to credit other countries with their full consumption makes America appear a veritable colossus, consuming five-eighths to two-thirds of the world's tin, and dwarfing other countries by comparison, whereas in 1924 and 1925 we actually consumed slightly less than half.

In the table given below account has been taken of all tin entering world supplies either as refined metal or in the form of concentrates, of the visible supplies at the end of each year, and consumption in other countries is shown by difference. It is not claimed that the resulting figures are beyond criticism, but the percentage of error would seem to be small, inasmuch as visible supplies have steadily decreased during the period under review, and no evidence has been found of hoarded supplies:

	World Deliveries (Consumption)			World Supplies Coming Into Sight From All Sources
	U. S. A.	Other Countries	Total	
1922.....	66,640	52,427	119,067	118,847
1923.....	72,815	57,801	130,616	126,627
1924.....	64,125	70,382	134,507	138,584
1925.....	76,455	76,757	153,212	146,148
1926.....	78,050	60,473	138,523	136,825
	358,085	317,840	675,925	667,031
Adding visible supply as of Dec. 31, 1921				25,220
				692,251
Subtracting total world deliveries.....				675,925
Gives visible supply as of Dec. 31, 1926..				16,326

Thus the figures show a shrinkage in the visible supply during the five year period of 8894 tons.

As regards the situation in this country, let us bear in mind that 1927 follows the most wonderful year in our business history. In 1926 we broke all previous records of tin consumption, largely because British industry was badly crippled, and export business which otherwise would have gone to British mills came to ours. Surely we cannot hope to go on year after year breaking records. However, 1927 has not been what could be called a bad year, as our deliveries will total about 73,000 tons, which is better than any other 12 months except 1925 and 1926, and unless most of our business forecasters are badly fooled, 1928 may bring us back to somewhere near the 1926 figures.

Looking at the figures for other countries, it will be seen that in 1924 they consumed about 6000 tons more than we did, and topped us slightly again in 1925 but, for the reason stated above, their 1926 figures show a severe decline. It should be noted though that not only Great Britain, but Germany and the other great industrial countries are coming back strong. Their population vastly exceeds ours and their needs are correspondingly greater; and, what is more to the point, their credit is improving and they are better able to finance their growing business.

In conclusion, the whole world is in a period of tremendous expansion. The motor car, airplane and radio are bringing all peoples into closer communication and increasing the needs of nations for commodities and products they formerly got along very well without. Tin is produced in but a few localities, but it is used everywhere. It seems then more logical to expect for some years to come that production will continue to lag behind consumption and that no serious decline in the price level may be expected until it catches up.

Zinc Values Touched Lowest Levels in Five Years

BY A MEMBER OF THE TRADE

IN zinc, the year 1927 was characterized by a downward trend of prices, which persisted with but slight interruption and which has resulted in lower market values than are warranted, in view of production costs to the industry as a whole.

At the beginning of the last quarter of 1926, when the metal was quotable at about $7.40 per hundred pounds East St. Louis, and in the face of record consumption, the trend of quotations started on a downward course which continued with but slight reactions until November, 1927. Then $5.60 East St. Louis was reached, the lowest point touched since 1922, and a figure which approximates the average for ten years prior to 1914.

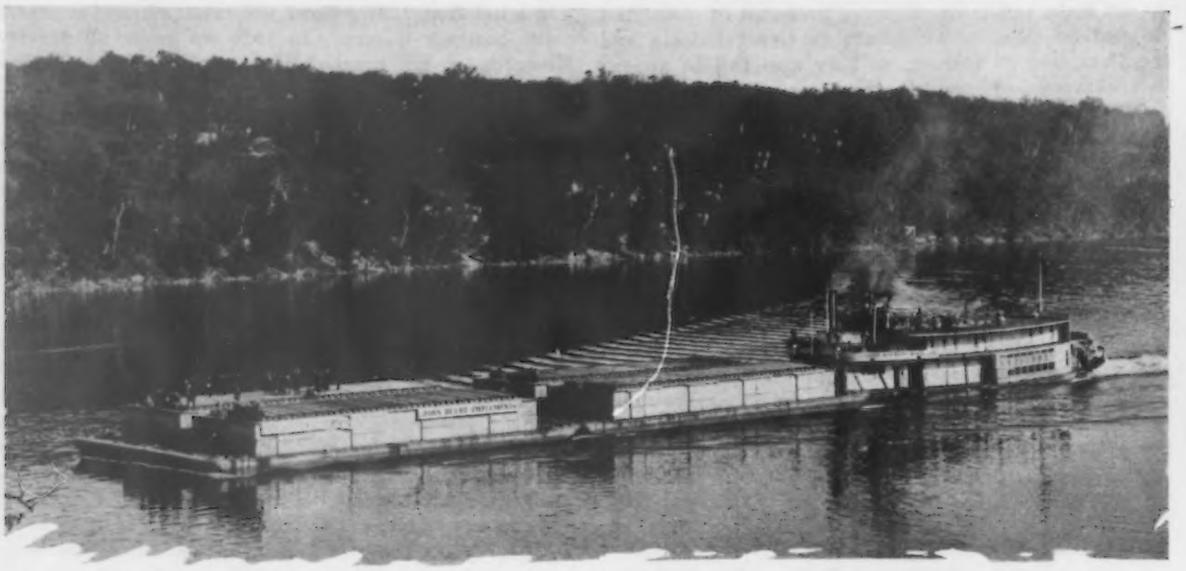
Primary spelter production for eleven months amounted to 561,200 tons, and estimating December at 50,000 tons, a total of about 610,000 tons might be expected for the year. In 1926 the total was 638,533. Domestic shipments, while not quite equal to the previous year, have been maintained in good volume, averaging about 46,000 tons monthly. Exports for 1927 will likely approximate the 1926 figure of 42,000 tons. This would indicate a probable total approaching 600,000 tons for the year just ended as compared with 625,941 for 1926.

Stocks of metal gradually increased from the low point, 14,481 tons at the end of November, 1926, to the end of June, 1927, when they reached a peak of 43,858 tons. The tide then turned and a decline began, leaving the stock on Nov. 30, 1927, at 39,320 tons.

Decreased consumption and increased stocks, no doubt, were the immediate cause of the decline in price, but the excess accumulation which, at its height never reached a month's supply, does not seem sufficient itself to account entirely for the long downward swing. The answer is probably to be found in the development of selective flotation for the treatment of complex ores and the growth of the electrolytic method for the recovery of the metal. This modification of the flotation process has made available a zinc value which was previously not only a loss but a penalty. It has enhanced the profits of many mines operating in the northern Rocky Mountain country and made profitable others which had been abandoned, resulting in a greatly increased production of zinc concentrates at a relatively low cost. The rapid increase in the electrolytic output coincides with this increasing ore supply and it is estimated that during 1928 upward of 250,000 tons of electrolytic capacity will be in operation in the Rocky Mountain region of this country and Canada.

The smelters of Continental Europe, who a few years ago were combing the world for ore, are now receiving an ample supply of zinc concentrates from Mexico and elsewhere, while production in Silesia has been stimulated by the introduction of American capital. As a consequence diminishing exports of spelter from this country probably may be expected.

To summarize: Selective flotation has made available a considerable quantity of cheap zinc concentrates particularly adapted for treatment by the electrolytic method. Properties producing such complex ores are being and will be developed, so that the relative importance of the Tri-State field—Missouri-Kansas-Oklahoma—as a basis of ore supply is likely to be lessened to some extent. Correspondingly, the slab zinc output produced by the electrolytic method is likely to be increased and the proportion produced by the retort method reduced. The principal factor determining the amount of slab zinc produced by the retort and electrolytic methods respectively will be the relative cost of mining and delivering the zinc in the concentrates produced at the smelter or electrolytic plant, and doubtless competition will be sharp in ascertaining on this basis the relative share for each method.



Further Gain in Water Shipments

River and Lake Movement of Iron and Steel Mounts—Pittsburgh District Traffic Largest on Record

WATER shipments of iron and steel showed a further gain in 1927. River traffic expanded, in the Pittsburgh district being the largest ever recorded, and there was a substantial increase in the movement of pig iron and steel, as well as scrap, on the Great Lakes. Progress was made in the canalization of the Ohio and Illinois rivers, and barge service was inaugurated on the upper Mississippi River.

While complete statistics for the river movement out of the Pittsburgh district are not available, those at hand clearly indicate a record. The figures reported monthly by the Pittsburgh district United States Engineers' office disclose that, for the 11 months ended Nov. 30, there had passed down the Allegheny River 12,967 net tons of iron and steel products; that in the same period shipments over the Monongahela River totaled 623,165 tons, while the iron and steel carried on the Ohio River from Pittsburgh as far as Wellsburg, W. Va., the limit of the Pittsburgh office survey, aggregated 628,790 tons. The grand total was 1,264,922 tons, but there was some duplication of figures in view of the fact that the Ohio River begins at Pittsburgh through the confluence at that point of the Allegheny and Monongahela rivers. Ignoring that total and taking only the tonnage carried on the Ohio River as indicative of what moved to distant down-river points, or well outside the zone that Pittsburgh producers could reach profitably by rail deliveries, the total of 628,790 tons for the 11 months exceeds the total movement on the Ohio River as reported from the several district engineers' offices at Pittsburgh, Huntington, W. Va., Cincinnati and Louisville, Ky., for all of 1926, which was 487,261 tons. It was also larger than the 1925 total of 534,817 tons.

In connection with this showing, it may be pointed out that the canalization of the Ohio River has not yet been completed between Evansville, Ind., and Cairo, Ill., and ordinarily that long stretch has a sufficient stage of water to carry heavy tows of steel only during about six months of the year. Nevertheless, the Jones & Laughlin Steel Corporation, for the first time since it started river service in the fall of 1921, maintained shipments throughout the summer of 1927, although in passing through the shallow water between Evansville and Cairo it was necessary to open completed locks behind the tows to provide enough water to carry them through to the deeper water beyond Cairo. The Federal Government, however, is making steady progress in its work on this section of the river, and present indications are that the lock and dam system and the establishment of a permanent 9-ft. stage from Pittsburgh to Cairo will be completed by 1929, as planned.

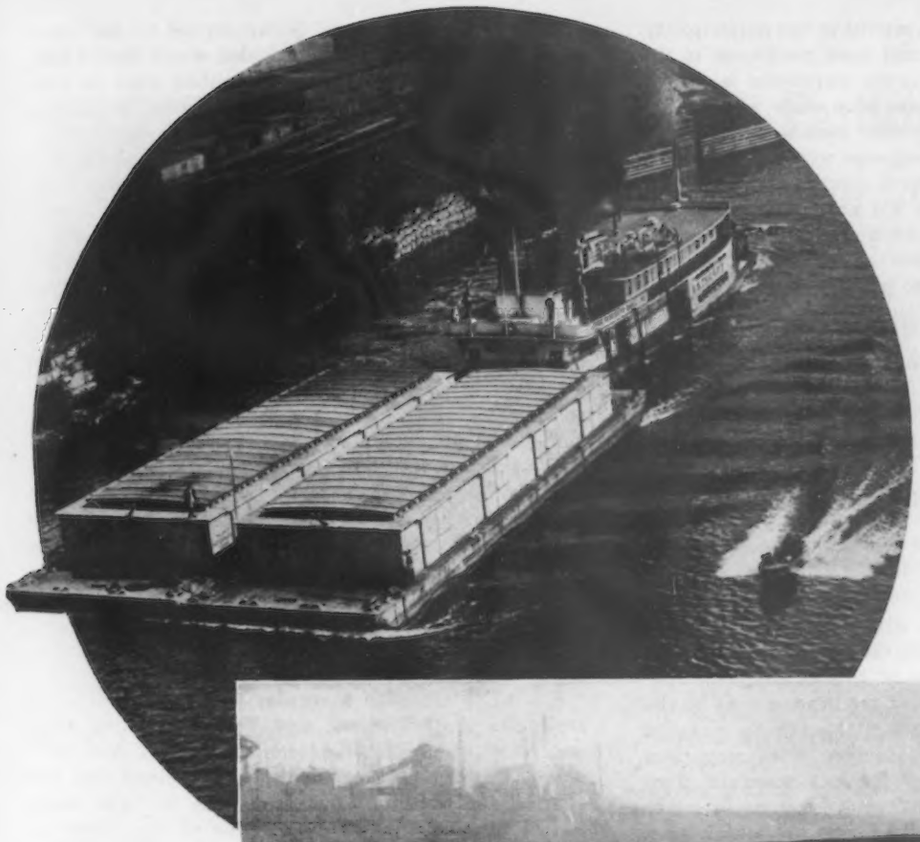
Iron and steel producers at lower Ohio River points also made more use of water transportation in 1927. One Ironton, Ohio, plant operated a towboat and a fleet of barges throughout the year to deliver pig iron and wire nails to Ohio River points. In quoting nails at Cincinnati and other cities along the river, the company made Ironton the base for prices, to which it added the regularly established barge rate charged by river packet companies. Another Ironton producer started shipping pig iron by barge in July. This company installed loading equipment on its property along the river but, instead of investing in river craft, contracted with a commercial line to handle its product.

In June a river-rail terminal at Cincinnati was formally put into operation. Here cargoes of iron and steel are transferred to railroad cars for delivery to consumers in the Cincinnati district. The terminal is used extensively by the Jones & Laughlin Steel Corporation in connection with the shipment of its products to its Cincinnati warehouse.

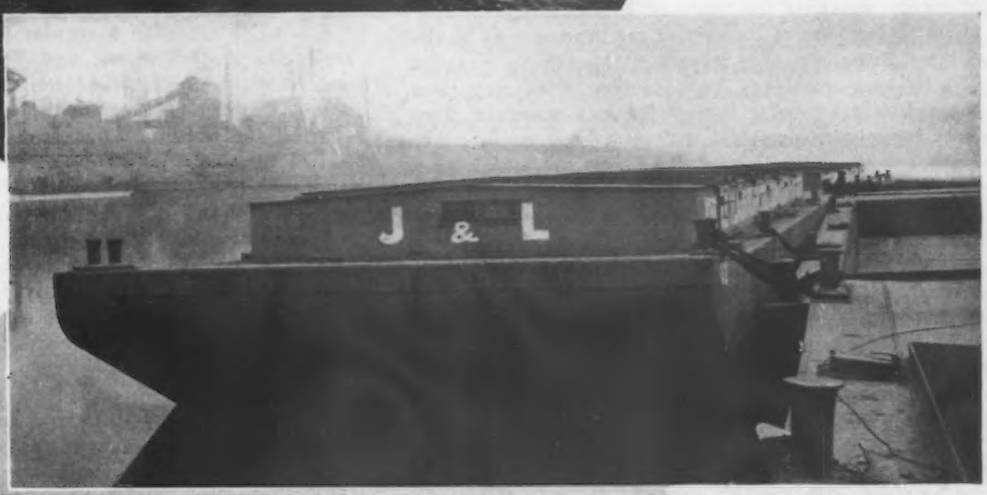
The Ohio River was also used during the year by the Granite City, Ill., producer of pig iron for shipments to points upstream as far as Louisville.

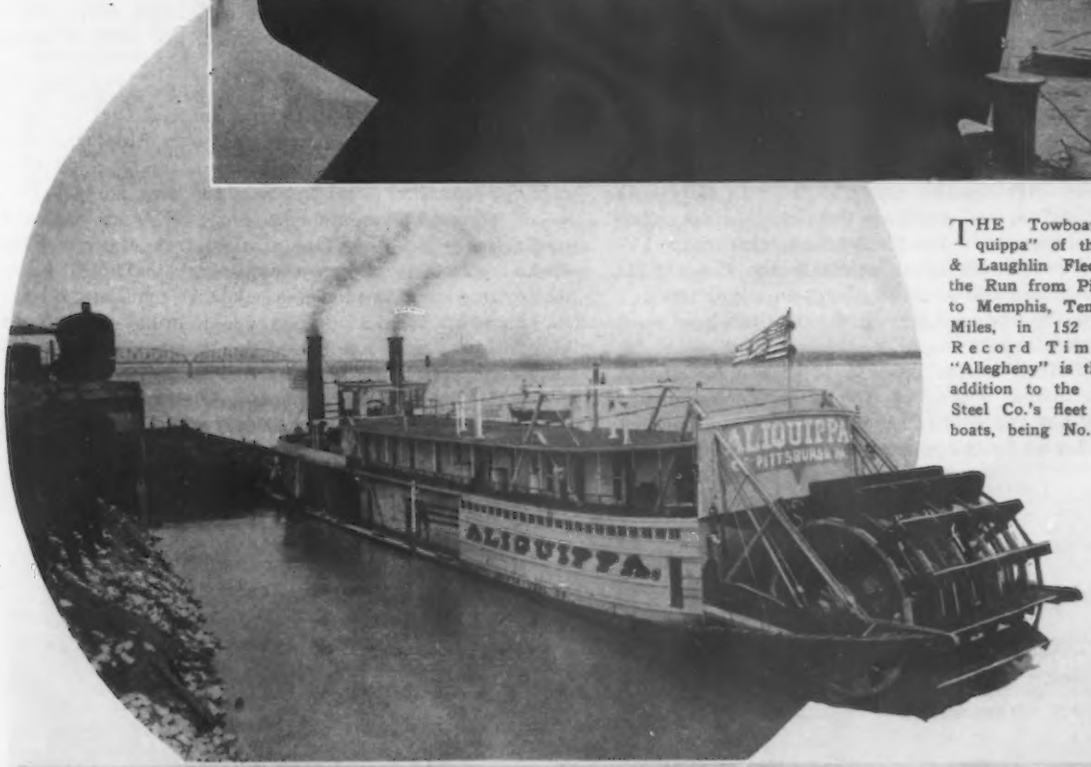
Of outstanding interest on the Mississippi River in 1927 was the inauguration of Federal barge service on the upper reaches of the stream in mid-August. In the three months during which the line was in operation a Granite City mill shipped a small tonnage of sheets to Minneapolis and Chicago district producers moved about 600 tons of various products, including fence, wire, nails, sheets, steel pipe, rail steel bars and soft steel bars. Producers in Indiana, Chicago and Peoria, Ill., shipped by rail to Dubuque, Iowa, and thence by barge to St. Paul and Minneapolis. The combined rail and water rate from Chicago to Minneapolis via Dubuque is 23½c. per 100 lb., as compared with an all-rail rate of 27½c.

At Minneapolis a river bank warehouse was con-



THE "Thorpe" Towing Barges from St. Paul to Minneapolis on the Upper Mississippi River (at Left). A box-type of barge, which is supplanting the coal barge as a carrier for steel, especially products damaged by exposure (below)





THE Towboat "Aliquippa" of the Jones & Laughlin Fleet Made the Run from Pittsburgh to Memphis, Tenn., 1200 Miles, in 152 Hr., a Record Time. The "Allegheny" is the latest addition to the Carnegie Steel Co.'s fleet of towboats, being No. 14.

structed, largely under the auspices of the municipality. As an inducement to iron and steel producers to use the barge line, free storage in the warehouse is offered. In addition, arrangements have been made whereby the barge company, during the winter months, will bill and load from stocks in the warehouse without charge.

The maximum draft of boats operating on the upper Mississippi River is between 4½ and 5 ft. Flood control reservoirs along this stretch of the river assure a 7-ft. channel throughout the season of navigation, which extends from April to mid-November. In this respect the upper river is more dependable than the lower stretches.

On the entire river the barge movement of all commodities in 1927 fell some 15 to 20 per cent below the total for 1926. The main causes were:

1. Spring floods adversely affected the credit of the communities along the lower stretches of the river, curtailing the volume of business transacted.

2. In September low water hampered the movement of river craft.

3. The general volume of business in 1927 was below that of 1926, which was a peak year in barge traffic on the river.

Of particular interest to the Chicago district is the work on the connecting link which is to join the Mississippi River system with the Great Lakes. In terms of money expended the State of Illinois has completed about 60 per cent of its part of the development of the Illinois River. In this stretch, locks 110 ft. wide by 600 ft. long are being built so that tows may pass through without being broken for lock passage. Two locks have been completed with the exception of mitre gates and operating machinery, and agreements have been reached with a public utility company whereby five miles of retaining wall through Joliet, Ill., and a lock and dam below that city can now be finished. A lock at Dresden Island, Ill., and a canal to be built around rapids at Marseilles, Ill., are the only projects that remain to be placed under contract by the State. South of Starved Rock, Ill., the river is ordinarily open to craft of 5 and 6-ft. draft, but the Federal Government nevertheless plans to improve that stretch with locks and dams.

Heavier Movement on Great Lakes

Nineteen twenty-seven showed a gain in shipments of steel, pig iron and scrap on the Great Lakes. One company alone moved 125,000 tons of scrap from Detroit and other Great Lakes points in the West to its plant at Buffalo, and shipped about an equal tonnage of steel in the opposite direction. A Cleveland steel manufacturer began to make shipments of steel by water to Detroit in the latter part of the navigation season and moved a total of about 30,000 tons, mostly sheets and hot and cold-rolled strip. This was handled on a boat leased by the company, and loading was done directly at the steel plant. Scrap carried by the vessel on return trips from Detroit totaled about 20,000 tons.

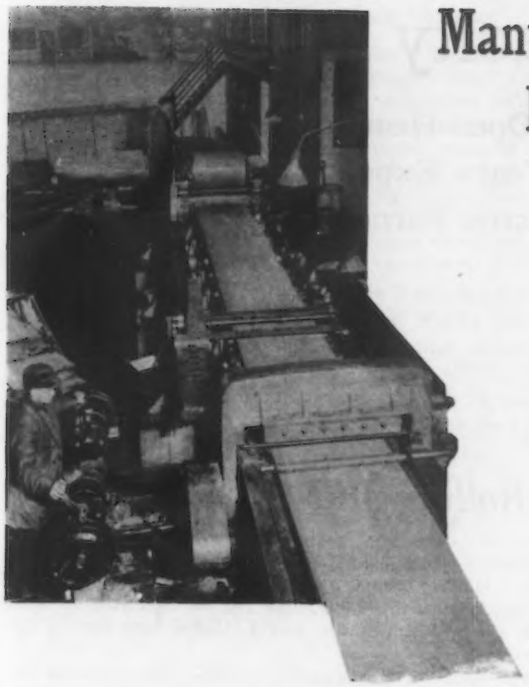
The United States Steel Corporation kept in commission four 250-ft. boats with a carrying capacity of 2000 tons each during the entire season, carrying finished steel for the Canadian trade. This Lake fleet is operated by a subsidiary, the United States Steel Products Co. It was the first year that four boats were in service throughout the navigation season, two of them having been completed in 1926. The company's Lake shipments in 1927, however, declined to 115,000 tons from a total of 130,000 tons in the previous year, reflecting a slowing up of demand. A Chicago company continued to use the Lakes for shipments of alloy steel to Detroit in the past year, and also received a 1200-ton cargo of alloy steel scrap from Great Britain.

Pig iron shipments on the Great Lakes were particularly heavy in 1927. A Buffalo producer shipped 42,000 tons, including 12,000 tons of silvery iron, to Detroit. Another Buffalo maker moved a cargo of 2000 tons to Chicago, and a third Buffalo interest made a shipment by water to Toledo, Ohio, whence it went by rail to its plant at Bremen, Ind. There were large Lake shipments from Cleveland to Chicago. One Cleveland producer shipped between 20,000 to 25,000 tons, and another 10,000 tons.

Efforts to establish a regular water transportation service between Cleveland and Detroit to carry steel from Valley and Cleveland mills have not met with success, and two dock companies in Cleveland that are equipped for handling steel from cars to Lake boats handled no tonnage whatever. One of the obstacles to water shipments to Detroit, perhaps the principal one, is the desire of large consumers in the automotive field to have a steady flow of steel from the mills to their plants. If an automobile manufacturer is using two or three cars of steel a day, he wants that number of carloads to reach his plant daily, and mills, aided by excellent transportation service, are able to make deliveries as desired.

Those interested in promoting water shipments of steel from Ohio mills to Detroit contend that as good service can be furnished by water as by rail. One plan suggested is to have three boats of about 1500 tons capacity handling steel between the two ports. This would permit shipments of a boatload every day and would insure a steady flow of steel from the receiving docks in Detroit to consuming plants. The 1500-ton cargo, according to this plan, could be made up of carlot shipments from a number of Ohio mills, which could be consigned to a number of consumers. It is stated that steel can be delivered from Valley mills by rail and water to consumers' yards in Detroit at $3.68 per ton, as compared with an all-rail rate of $5.30, or a saving of $1.62 per ton.

A Car Ferry Put into Commission During the Year by the Jones & Laughlin Steel Corporation, Connecting Its Pittsburgh and Woodlawn, Pa., Works, Permits Partial Loading at Each Plant, Eliminating Interplant Movements by Rail



Many Factors Participated in Development of Continuous Sheet

Administration of Patents and the Economic Relation of Strip Mills to New and Old Style Sheet Mills Are Future Problems of Importance

WHILE the art of rolling steel has progressed in many details during 1927, and more powerful, more productive, and more economical units have been installed at various places, the progress in the sheet industry has deservedly attracted the most attention. The sheet industry, the last of the divisions of the steel business to respond to the urgent call for improvements, has been going through an evolution which has culminated in a radical departure from the established and traditional methods, and which probably will have the same effect on the conventional sheet mills as the development of the modern continuous bar mill had on the old-fashioned hand mills.

Great Tonnages Needed

Just as the present continuous merchant mills are only economical for large tonnages, so the new method of making sheets will by the law of economics be applicable only to large tonnage plants. The old idea must be discarded that large tonnages mean inferior quality, for it has been one of the surprising discoveries of this new method that both the surface condition and the grain structure are improved.

It is strange that such a development should have been so long in coming, but possibly it had to wait for a growth in the sheet business to the point where much larger tonnages were required. Or it may be entirely possible that it was the increased knowledge and inventive genius of the new generation coming after the expensive failure of some twenty-two years ago, which coupled to all the other factors, crystallized into the achievement.

Precision Without Precedent

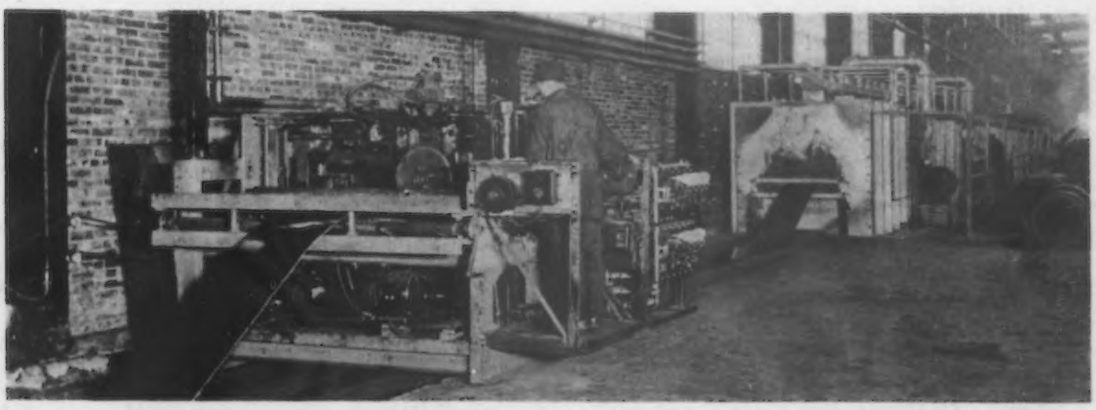
The process also has been scientifically analyzed, in the same way as with the blast furnace some years ago which resulted in better control, larger output and lower cost. Scientific appliances were developed to record rolling pressures, and instruments devised to measure roll diameters to the thousandth of an inch. These merely furnished the data which had to be interpreted and then applied to the design of the modern mills.

Rolling of long pieces of wide thin material might be done by extending the length of sheets, or by increasing the width of strips. It is interesting, in retrospect at least, to note that while there are these two avenues of approach to a solution of this problem, what seemed the most difficult was solved first. As recorded in Stephen Badlam's paper read before the American Iron and Steel Institute on Oct. 28, 1927, the sheet development has made the greatest step forward in a relatively short time, while the strip process has been gradually but steadily advancing. However, the strip process has not yet been able to reach the ratio of width to thinness that is now regularly employed for the continuous manufacture of sheets.

It will be very interesting to watch the further progress with these two methods of solving one of the outstanding problems of the steel industry, and it is entirely possible that each method will find its own economic limitations.

Some of the elements contributing to the successful operation of this improvement in rolling mill practice

(*Concluded on page* 109)



Less New Capacity in 1927

No Blast Furnaces Added—Open-Hearth Increase Was 630,000 Tons Last Year—Expansion for 1928 Very Light—Few Electric Furnaces Sold

ONLY moderate increases in capacity, both blast furnace and steel-making, for this and the year just ended, are disclosed by a review of the year's activities.

For the second year since the war, blast furnace capacity in 1927 was not increased. Only two furnaces are scheduled for possible completion this year.

In open-hearth construction, new capacity last year at 630,000 tons ranked fourth since the war. Projected additions are the smallest in the last few years.

Expansion in Steel, Iron and Rolling Mill Capacity

COMPARATIVELY lean was the 1927 record of additions to steel melting and blast furnace capacity, with the projected plans for 1928 exceedingly small. Major details of new construction and equipment completed in 1927 or planned for completion in 1928 have been sent in by companies having blast furnaces, steel plants and rolling mills, as well as some foundries. A summary of the data is given in the following paragraphs.

Open-Hearth Capacity Added in 1927

Expansion of open-hearth capacity in 1927 was larger than was indicated in our review a year ago. Only three furnaces were then reported as scheduled for building during 1927 but there were 10 furnaces completed.

The 1927 additions of 10 furnaces have an estimated capacity of 630,000 gross tons per year. This compares with 865,000 tons for 12 new furnaces in 1926. The largest year since the war was 1923, when the total additions were 875,000 tons for 19 furnaces. Last year ranks fourth among the years since the war, as shown by one of the tables. The distribution of the new additions last year is shown in another table.

The additions to open-hearth capacity in 1927 were made by the following companies:

Ford Motor Co., River Rouge, Mich., three 100-ton furnaces; Interstate Iron & Steel Co., Chicago, two 100-ton furnaces; Weirton Steel Co., Weirton, W. Va., one 200-ton furnace; Otis Steel Co., Cleveland, one 125-ton furnace; Timken Roller Bearing Co., Canton, Ohio, one 100-ton furnace; Colorado Fuel & Iron Co., Pueblo, Colo., one 90-ton furnace, and the Bonney-Floyd Co., Columbus, Ohio, one 15-ton furnace for steel castings.

Open-Hearth Units Planned

Only two open-hearth furnaces are scheduled for building in 1928. This is the smallest projected total since the war. The 1928 program compares with 3 in 1927, with 14 in 1926, with 9 in 1925, with 7 in 1924, with 17 in 1923, with 6 in 1922, with 15 in 1921 and with 22 in 1920. One of the war years witnessed the largest scheduled expansion on record—91 furnaces in 1916.

The estimated capacity of the two furnaces, planned for completion this year, is 125,000 gross tons of ingots per year. The smallest projected capacity on record, previous to this, was 217,500 tons for six furnaces in 1922. During peace years the largest contemplated additions were 3,100,000 tons for 88 furnaces in 1913, while the war maximum was 4,515,000 tons for 72 furnaces in 1917.

The additions to capacity planned for 1928 are two 100-ton furnaces now under construction by the Wisconsin Steel Co., Chicago, at its South Chicago plant.

Several companies rebuilt and increased the capacity of their open-hearth furnaces last year, one company changing a 100-ton furnace to one of 200 tons capacity and other companies materially enlarging older units.

No Increase in Blast Furnaces Last Year

For the second year since the war, no new blast furnaces were built. Last year three were projected, but the building of one was rendered unnecessary and the other two are still unfinished.

The 1927 record of no additions to blast furnace capacity duplicates the record in 1923 when none was built. In 1926 there were six new furnaces put in blast, constituting a record since the war, so far as productive capacity is concerned. In 1920 also six new furnaces were finished. The capacity of the six furnaces in 1926 was 1,255,000 tons, while that of the six in 1920 was estimated at 875,000 tons. In 1919 only two furnaces were added with one in 1921, with two in 1922 and with one each in 1924 and 1925.

The record for new blast furnaces completed in any peace year was nine in 1912, with the war record at 14 in 1917.

New Blast Furnaces in 1928

Only two furnaces are under construction for possible completion in 1928. This compares with three in 1927, with nine in 1926 and with five during the three years 1921 to 1923. The record for those projected in any one year was 25 in 1917 with the peace-time record in recent years at seven furnaces in 1913. The capacity of the two furnaces under construction is estimated at 440,000 gross tons. They are the two furnaces at the Fairfield Works of the Tennessee Coal, Iron & Rail-

Additions to Open-Hearth Capacity Since the War

Year	Annual Capacity, Gross Tons	Year	Annual Capacity, Gross Tons
1919	625,000	1924	375,000
1920	675,000	1925	585,000
1921	247,500	1926	865,000
1922	227,500	1927	630,000
1923	875,000		

Increase in Open-Hearth Capacity

	No. of Furnaces	Annual Capacity, Gross Tons
Completed in 1927:		
Independent companies	10	630,000
United States Steel Corporation	0	.....
Total	10	630,000
Projected for 1928:		
Independent companies	2	125,000
United States Steel Corporation	0	.....
Total	2	125,000

road Co., in Alabama, which were under construction a year ago.

Several Furnaces Rebuilt and Enlarged

A number of companies, particularly the Bethlehem Steel Corporation and the United States Steel Corporation, have rebuilt and enlarged a number of their blast furnaces. The Donner Steel Co., Buffalo, rebuilt its No. 2 furnace, increasing its annual capacity from 180,000 tons to 216,000 tons. The Reading Iron Co., Reading, Pa., augmented the capacity of its Keystone furnace about 25 per cent.

Abandoning and scrapping of blast furnaces continued last year. On Jan. 1, 1927, there were 371 furnaces on the active list. On Jan. 1, 1928, the number stands at 357, indicating a dropping of 14 furnaces during 1927.

The chief features of the reports of the various companies on new construction completed or planned are as follows:

The Steel Corporation

NEW construction and improvements completed during 1927 and under way as of Jan. 1, 1928, by subsidiary manufacturing companies of the United States Steel Corporation, are as follows:

Carnegie Steel Co.

Completed

Edgar Thomson Works: Four open-hearth furnaces rebuilt.

Duquesne Works: Modernizing 4 hot blast stoves at blast furnace No. 5.

Homestead Works: Installing 44-in. and 54-in. blooming mills, 36-in. roughing mill, 28-in.-32-in. structural and 52-in. universal structural mills in lieu of obsolete mills.

Carrie Furnaces: Blast furnaces Nos. 3 and 4 rebuilt, with auxiliary ore handling facilities.

Ohio Works: Improving operating facilities at open-hearth plant; 15 waste-heat boilers at open-hearth plant.

Upper Union (Youngstown) Works: Electrifying mills, replacing steam power.

McDonald Mills: New 12-in. strip mill.

Mingo Works: Eight 1200-hp. gas-fired boilers in blast furnace No. 2 boiler house.

Houston, Texas: New warehouse and dock.

Under Way

Edgar Thomson Works: Turbo-blowing equipment for 2 blast furnaces, replacing obsolete steam engine equipment; 15,000-kw. turbo-generator and auxiliary equipment in power station.

Duquesne Works: New central boiler plant at blast furnaces.

Ohio Works: Two 1500-ton hot-metal mixers.

Farrell Works: Modernizing rolling mill facilities and power generating equipment, including 24-in. roughing mill and 6000-kw. a. c. turbo-generator.

Clairton Works: Addition to by-product coke plant of four batteries, 87 19-ton ovens each, with tar and ammonium sulphate recovery, benzol plant and gas booster station and auxiliary facilities.

A high-tension electric power transmission system, with necessary sub-stations, is being constructed to "tie in" Edgar Thomson Works, Duquesne Works, Carrie Furnaces, the by-product coke plant at Clairton and National Works of National Tube Co.

Illinois Steel Co.

Completed

South Works: New 40-in. reversing blooming mill in No. 1 rail mill; new merchant bar mill for production of alloy steels; gas engine-driven electric generating unit addition to power station.

Gary Works: New 10-in. and 9-in. merchant mills.

Under Way

South Works: Rebuilding blast furnace No. 10 and 8 hot blast stoves at blast furnaces Nos. 5 and 6; enlarging 14 furnaces at No. 2 open-hearth plant and modernizing auxiliary facilities; two 6000-kw. gas engine-driven electric generating unit additions to No. 1 power station; equipping north end structural mills with electric drives, replacing steam power.

Joliet Works: New boiler plant.

Gary Works: Additional 30,000-kw. steam turbo-electric generating unit in power station.

National Tube Co.

Completed

National Works: Blast furnace No. 2 rebuilt; improved stock handling system at bins of blast furnaces Nos. 2 and 4.

Under Way

Lorain Works: New 32-in. mill for rolling rounds at No. 3 blooming mill; converting No. 3 lap weld mill into a seamless mill; 15,000 kw. steam turbine-driven generator and auxiliaries; extension to blast furnace boiler plant, including three 2500-hp. boilers.

American Steel & Wire Co.

Completed

Newburgh Steel Works: New scrap and mold yards at open-hearth plant.

Newburgh Wire Works: Electrification of Nos. 1 and 2 wire mills.

Cuyahoga Works: Additions to cold rolling facilities.

Central Furnaces and Docks: New boiler house, pump house, 10,000-kw. turbo-generator, electric power transmission line to Cuyahoga Works and main water and sewer lines.

American Works: Continuous wire drawing equipment for fine weaving wire.

Waukegan Works: Billet heating furnace.

Trenton Works: Equipment for making bridge wire.

Worcester, South Works: Rebuilding and improving rolling mills, including new 18-in. billet mill and new 10-in. continuous rod mill.

Worcester, Electric Cable Works: Increasing capacity for manufacture of enameled magnet wire; equipment for manufacture of super-tension power cables.

Under Way

Newburgh Wire Works: Improvements in cold finished bar department.

Cuyahoga Works: New rolling mills for large rods and narrow strips.

Anderson Works: Addition of electric welded fabric department.

Worcester, South Works: Modernizing No. 2 rod mill.

Worcester, Electric Cable Works: Equipment for manufacturing copper strand.

American Sheet & Tin Plate Co.

Completed

Gary Sheet Works: Equipping 2 double sheet mills to make full finished sheets.

Vandergrift Works: New heavy-duty unaflow engine for hot mill and sheet and pair furnaces for mills Nos. 22 to 25 rebuilt; 4 modern stoker-fired sheet and pair furnaces and equipping annealing and pickling department for finishing sheets 66-in. wide.

Scottdale Works: Motor drive for hot mills and rearranging hot mill department; modern bar storage building with electric overhead traveling crane.

Wood Works: 100-ft. continuous open annealing furnace.

National Works: Two annealing furnaces and enlarging annealing building.

Cambridge Works: Addition to boiler plant.

Under Way

Gary Tin Works: Enlargement of plant including installation of new motor-driven continuous mill with auxiliary facilities, increasing finishing capacity.

Wood Works: Motor-driven cluster-type cold mill for rolling highly finished sheets.

Tennessee Coal, Iron & Railroad Co.

Completed

Fairfield Works: Two additional soaking pits and extending building; additional spike, bolt and nut units for rail fastenings department; fifth galvanizing unit at sheet mill; modern gas exhauster and saturator equipment at by-product coke plant.

Under Way

Fairfield Works: Two new blast furnaces Nos. 5 and 6; electric power plant of two 25,000-kw. turbo-generators; addition to by-product coke plant of battery of 63 18-ton coke ovens.

Bethlehem Steel Corporation

THE subsidiary companies of Bethlehem Steel Corporation report the following principal improvements and additions completed in 1927 and under way at the close of the year.

Completed

Bethlehem Plant, Bethlehem, Pa.: 10,000-kw. turbo-generator; two Bethlehem gas-driven blowing engines; five

heavy-duty roll lathes and additional machine tools for manufacture of Bethlehem auxiliary locomotives.

Steelton Plant, Steelton, Pa.: One Bethlehem gas-driven generator and gas cleaners; 10 gas producers and two waste-heat boilers at open-hearth plant.

Lebanon Plant, Lebanon, Pa.: Addition to concentrating and sintering plant.

Maryland Plant, Sparrows Point, Md.: 20,000-kw. turbo-generator and boilers; one two-strand pig casting machine; three gas producers and two waste-heat boilers at open-hearth plant No. 2; one row of soaking pits with producers; one 27-in.-24-in. four-stand continuous roughing mill and one 21-in. eight-stand continuous sheet-bar and skelp mill; 12-in. continuous skelp mill; four double sheet mills; 12 tin plate mills and two butt-weld pipe mills.

Lackawanna Plant, Lackawanna, N. Y.: One battery of 57 Koppers coke ovens and gas producers; gas producers for eight furnaces at open-hearth plant No. 1; one 54-in. blooming and two 48-in. Bethlehem structural mills with shipping yard facilities; motor drive for 12-in. bar mill and addition to fabricating shop.

Cambria Plant, Johnstown, Pa.: One battery of 77 Koppers coke ovens; three waste-heat boilers at lower open-hearth plant and lumber mill at car shops.

Coatesville Plant, Coatesville, Pa.: Motor drive for 152-in. plate mill.

Under Way

Steelton Plant, Steelton, Pa.: New stack to replace present "B" stack; coke wharf and screening station at coke ovens and two waste-heat boilers and four gas producers at open-hearth plant.

Maryland Plant, Sparrows Point, Md.: New stack to replace present "A" stack; two turbo-blowers with boiler equipment; four waste-heat boilers at open-hearth plant and two lap-weld pipe mills.

Lackawanna Plant, Lackawanna, N. Y.: Ingot stripper at open-hearth plant; 72-in. cold saw at shipping yard and new rail blooming and roughing mills to replace present mill.

Cambria Plant, Johnstown, Pa.: Three 2-strand pig casting machines and two waste-heat boilers at Franklin open-hearth plant.

Ore Mining Properties

At its ore mining properties, 25 dwellings were erected at the Cornwall Mines, Cornwall, Pa. At the same property a 1200-ft. shaft with railroad spur as well as a crushing and screening plant are under way.

Youngstown Sheet & Tube Co.

THE Youngstown Sheet & Tube Co., Youngstown, completed during 1927 at its various plants, the following construction work:

Campbell Works

Blast Furnace Plant: The enlargement of the hearth on "A" furnace to 20 ft. 6 in. The installation on "A," "B" and "C" furnaces of 6 stage A. G. McKee Co.'s gas washers; a new 10-ton trolley for No. 1 ore bridge.

Coke Plant: A complete drinking water system and installation of electric refrigeration.

Steel Plant: The installation at the sheet mills of a balanced rougher roll drive; also a mechanically operated sheet pack opening machine.

Tube Mills: The installation in the machine shop of a 60-in. planer and a bar shear; the installation in connection with the seamless tube mill of complete threading floor equipment consisting of threading and cutting-off machines, together with necessary tables for the handling of pipe.

General: The installation of an overhead crane in the forge shop; a new employment office was built at the north bridge in Campbell and a new waiting room and gate office was built at the south entrance to the plant.

Struthers Works

A complete new installation for nail washing was installed at the nail mill. A pipe bending machine for the manufacture of conduit elbows has been placed in operation.

Brier Hill Works

A continuous annealing furnace was installed in connection with the sheet mills.

Western Reserve Works

Three continuous annealing furnaces were installed.

Hubbard Works

The enlargement of the hearth on No. 1 furnace to 16 ft. was completed.

In connection with the new Valley Mold & Foundry plant at Hubbard, installation was made of one 800-hp. boiler with complete equipment.

Indiana Harbor Works

Steel Plant: A complete mold cleaning yard was installed at the Bessemer department. Twenty-five additional open-hearth charging cars were put into service. An electrically operated Mesta manipulator was installed at the 28-in. billet mill. A 1000-ton Mesta up-cut shear and accompanying tables were installed at the blooming mill.

General: An extension to the machine shop with the necessary machine tools was completed. Low head pumps were installed at the intake. A modern restaurant with electric refrigeration was completed. The sea wall inclosing the entire plant was completed, together with a quantity of sand fill. An automobile fire truck was put into service for emergency use.

Coke Plant: A complete water treating system was installed at the coke plant boiler house. A 110-ft. extension was added to the coal storage yard. A gas meter for the surplus gas was installed.

Evanston Works

Improvements in operation at the Evanston plant were made by the addition of new size roll machines, pipe straightening machines and equipment for forging and finishing at the union department.

Mayville Works

An electric power shovel was installed at the mines and a complete water treating system was put in.

New construction under way and scheduled for completion in 1928 is as follows:

A power house and boiler house at the Campbell Works. This project will consist of the complete installation of six 2000-hp. B. & W. gas-fired boilers with auxiliary equipment to enable these boilers to be operated with pulverized coal; one 18,000-kw. turbo-generator and three 60,000-cu. ft. turbo-blowers. There will also be installed in connection with the above project, a 9375-k.v.a. frequency changer together with necessary transmission lines.

At the South Chicago Plant, there is under construction, a 70-oven Koppers coke plant complete with by-product equipment.

Republic Iron & Steel Co.

The Republic Iron & Steel Co., Youngstown, reports the following improvements as having been made during 1927 and as under way or contemplated in 1928.

A new open-hearth furnace, rated at 150 tons capacity, was built to replace the old No. 1 furnace at the open-hearth plant at Youngstown.

At the Bessemer and Brown-Bonnell plants at Youngstown, a new electric crane runway was added to the roll shop and a new roll grinder installed. There has also been completed a new chemical laboratory and office building.

At the tube works at Youngstown, testing machines and 40-ft. welding skids have been completed, and a lathe has been added to the machine shop equipment. The remodeling of the four butt weld mills is now under way.

At the coke works at Youngstown, alterations have been completed to the coke screening equipment.

A 200-ton Greenawalt sintering plant has been completed at the Haselton furnaces, Youngstown. New gas burner equipment has been provided for the stoves at No. 2 blast furnace.

At the Republic coke plant, Republic, Pa., the steam-operated plant was replaced last year with an electric power plant.

At the Pioneer blast furnaces at Thomas, Ala., four Heine boilers, 784 hp., were added to the boiler plant; one 3000-kw. generator was added to the electrical equipment and one 75-ton overhead crane was installed at the pig casting machine.

Weirton Steel Co.

The Weirton Steel Co., Weirton, W. Va., completed last year the 200-ton open-hearth furnace which was under construction a year ago. It also changed one of its 100-ton furnaces to a 200-ton unit. This gives the company six 100-ton and five 200-ton open-hearth furnaces.

As announced in THE IRON AGE, Sept. 1, 1926, page 585, the company placed in operation late last year its new 48-in. wide strip mill, with three continuous heating furnaces fired by producer gas. The mill is capable of rolling hot strip up to 48 in. wide. The company states that it is regularly producing 36 in. x 16 gage hot-rolled material. The mill is complete with pickling, cold rolling, annealing and finishing facilities, and

is expected to have a productive capacity of about 25,000 to 30,000 tons per month. The company reports that the entire mill is driven by power generated in its central station, located adjacent to the blast furnaces, current being transmitted to the plant under tension of 6600 volts, this voltage being used direct by the main power units, the hot mill having 18,000 hp. connected with the various drives, the other power being stepped down to 550 volts a.c. for cranes, auxiliary motors, etc. Two 1000-kw. sets are also installed, supplying 230-volt d.c. for various applications requiring this voltage. No additional productive capacity is under consideration for building this year.

John A. Roebling's Sons Co.

The John A. Roebling's Sons Co., at its Roebling, N. J., plant, last year completed the building of cleaning house No. 3 and added wire drawing benches in wire mills No. 2, 3 and 4. Heavy wire drawing benches were rebuilt in No. 1 wire mill. Tempering and galvanizing machinery was added and the material handling system was extended. All wire mills and other important buildings were equipped with sprinklers.

At the Trenton plant, Trenton, N. J., the company has nearly completed a new tinning shop. Also additional high-speed stranders were built and installed and a new general office building and a general stores building were completed.

For 1928 a 320-ft. extension to wire mill No. 4 at the Roebling plant is under construction and the galvanizing capacity will be increased. At Trenton a physical laboratory will be erected and there will be installed in it a wire rope testing machine having a capacity of 2,000,000 lb.

American Rolling Mill Co.

The American Rolling Mill Co., Middletown, Ohio, completed last year the improvements which were under way at its Ashland, Ky., and Zanesville, Ohio, plants. Certain improvements and additions which are considered necessary to the rounding out of the company's Butler, Pa., works are under way. Improvements at the company's East Side Works at Middletown, incidental to the adaptation and use of hot metal in the open-hearth department and other contemplated betterments, are reported well under way.

The building of a blast furnace at Ashland, Ky., which was contemplated a year ago, has been made unnecessary at this time because of the purchase of the Norton Iron Works.

Colorado Fuel & Iron Co.

The Colorado Fuel & Iron Co., Pueblo, Colo., added last year a new 90-ton open-hearth furnace to its melting department. It also completed the construction of a 25-in. structural mill consisting of three roughing and one finishing stand; a 10,000-kw. turbogenerator; a plant for punching hot tie plates; a repumping plant; a new quenching station at the coke plant and eight additional precipitators for blast furnace gas. The pig casting machine was rebuilt and the capacity of the sintering plant was doubled. For this year the company has under way five additions to the 25-in. mill warehouse.

Trumbull Steel Co.

The Trumbull Steel Co., Warren, Ohio, made alterations to its No. 1 hot strip mill, converting it into a new continuous mill which has a capacity to roll strip steel up to 30 in. wide. This was placed in operation June 16 and was described in the Sept. 15 issue of THE IRON AGE. To provide a mill for rolling wide material the company widened the rolls of its former No. 1 hot strip mill and added additional rolls, making the complete unit a 10-mill stand. A 45-ft. x 250-ft. cooling bed with necessary shearing and piling equipment was built at the No. 2 hot strip mill. In the cold rolling department a 4-high cold mill was erected with auxiliary equipment for wide strip steel and five double-box annealing furnaces were provided. In the sheet and tin department a continuous open annealing furnace for sheet and strip steel was erected. At the present time the company has under construction alterations to its No. 2 hot strip mill and is installing a No. 2 cold mill for wide strip, together with necessary pickling and other auxiliary equipment and shipping departments.

Otis Steel Co.

The Otis Steel Co., Cleveland, completed and placed in operation a 125-ton open-hearth furnace during the past year. Other additions made to the open-hearth department during the year included a 7½-ton Morgan floor charging machine, one 200-ton ladle crane, two 140-ton steel ladles, thirty 4-box charging cars and a 50-ton track scale. An additional 4-hole soaking pit was built at the blooming mill. Extensions were made to the sheet mill building and a motor control house was built. New equipment added to this department included two continuous normalizing furnaces, six double box annealing furnaces, two single box annealing furnaces, two scrubbers and dryers for the sheet mill, one Mesta pickler, scrubber and dryer for pickler, a 1200-hp. motor drive for sheet mill and 20 roll heaters. A polishing and buffing machine was added to the cold strip mill equipment.

Central Alloy Steel Corporation

The Central Alloy Steel Corporation, Massillon, Ohio, last year made a number of changes and adjustments in its Massillon and Canton plants, which were necessitated by the merging of the Central Steel Co. and the United Alloy Steel Corporation. At the Canton plant a 34-in. 2-high reversing mill was installed behind the blooming mill, a 15-ton electric furnace and a 30-ton ladle were added to the electric furnace department and the open-hearth department was equipped to burn coke oven gas and tar. The blast furnace is now being relined and a Dorr thickener and filter for reclaiming water sludge is being installed. The gas washer is being revamped and automatic straight line control installed. Freyn pressure burners were added to the stoves and the boiler fire boxes were enlarged.

At the Massillon works, the coke oven plant of 49 Koppers ovens and a by-product and benzol plant were completed and put in operation. A Bliss cluster mill was added to the sheet division. Other construction work by the company included the erection of a metallurgical laboratory provided with modern equipment for research work.

Jones & Laughlin Steel Corporation

The Jones & Laughlin Steel Corporation, Pittsburgh, last year completed the erection of the seamless tube mill and a 9500-hp. powdered coal fired boiler plant which was started in 1926. The rebuilding of a 44-in. blooming mill at the South Side works has already been finished. In July last year a car ferry was installed for the purpose of transporting via the river material between the Pittsburgh and Aliquippa plants.

Alan Wood Iron & Steel Co.

The Alan Wood Iron & Steel Co., Philadelphia, last year constructed at its blast furnace department at Swedeland, Pa., two 7-tray, 2-stage gas washers, including filter and sludge thickener. It placed in operation during 1927 its Schuylkill Iron Works at Conshohocken, Pa., consisting of one 32 x 60-in. hot sheet mill, one roughing and one finishing stand with 600-hp. motor. This mill was started last June. The company is installing a 1000-hp. motor on its 54-in. jobbing mill to replace steam driven equipment and expects this to be in operation by Feb. 1, this year.

Central Iron & Steel Co.

The Central Iron & Steel Co., Harrisburg, Pa., last year installed a Blaw-Knox dolomite machine for its open-hearth furnaces and laid a concrete floor with non-skid floor plates in its 42-in. universal mill, as well as completed the powdered coal installation which was started in 1925 which furnishes fuel for all reheating

furnaces in the rolling mills. The ingot storage yards of the 126-in. mill and the 42-in. universal mill have been consolidated.

Bourne-Fuller Co.

The Bourne-Fuller Co., Cleveland, completed in July last year the erection of a 10-in. semi-continuous bar mill at its Union plant, this taking the place of an old 9-in. mill which was removed. Extensions were made to the mill building to provide room for the new equipment. The mill consists of 8 continuous and 4 semi-continuous stands. A large 32-ft. billet heating furnace was also erected. In addition the company built at its Union works two 75-ft. x 430-ft. warehouse buildings in which it has provided equipment for fabricating reinforcing bars. This company last year continued its work of electrifying its Upson steel plant. It has under way at the present time the installation of an electric drive for its 11-in. bar mill at its Upson plant. It completed in March the erection of a 4000-hp. reversing motor and a 3600-kw. motor generator set for driving its blooming mill. It is also putting in a 5000-kw. turbogenerator to replace two smaller units. The company last year completed the erection of a turboblower to replace steam blowing engines at its blast furnace.

Timken Roller Bearing Co.

The Timken Roller Bearing Co., Canton, Ohio, completed its new steel plant in 1927 and placed it in operation during the early part of the year. The new steel making department, housed in a new building, is equipped with one 100-ton open-hearth furnace and two 15-ton Heroult and one 7-ton Heroult electric furnace. The 5-ton Heroult furnaces formerly used have been dismantled. Changes were made in the drive on two of the mills. The drive of the 22-in. mill was changed from a rope to a gear drive and a 1500-hp. Farrel-Sykes double herringbone gear was installed. The drive of the piercing mill was changed to a 350-hp. Nuttall single helical unit. Both gear drives have Timken bearings on their shafts.

Donner Steel Co.

The Donner Steel Co., Inc., Buffalo, N. Y., completely rebuilt last year its No. 2 blast furnace, increasing its capacity from 180,000 to 216,000 gross tons per year, and equipped it with an Ingersoll-Rand turboblower, with a McKee top and with coke handling and cleaning apparatus. Early this year a new cold drawing department will be installed, as well as a 25-ton Heroult electric furnace.

Ford Motor Co.

The Ford Motor Co., Fordson, Mich., completed in December, 1927, a 12-in. mill for rolling spring steel. This it is expected will be placed in operation in a few weeks. The Ford company has under erection a 10-in. combination merchant mill for rolling bars, rods and strip steel. This will be completed about July, according to present expectations.

The company completed last year three stationary 100-ton open-hearth furnaces, bringing the total to seven furnaces, the other four being of the tilting type.

Worth Steel Co.

The Worth Steel Co., Claymont, Del., completed last year its new flanging and press shop in which is contained three spinning machines. One of these is claimed to be the largest of its kind in the country, being able to flange circles varying in dimension from ½-in. x 180-in. blank to 4-in. x 56-in. blank. On this machine it is also possible to make heads having a 20-in. straight flange. This department, besides other equipment, has two large open throat presses.

Corrigan, McKinney Steel Co.

The Corrigan, McKinney Steel Co., Cleveland, finished the erection of a 12-in. merchant bar mill, which was placed in operation in February, 1927. This completed this company's finishing mill building program, which included a 10-in. mill completed late in 1926. No other extension work was done last year and the company does not contemplate any new construction work in 1928.

Interstate Iron & Steel Co.

The Interstate Iron & Steel Co., Chicago, added two 100-ton open-hearth furnaces to its melting department last year. Early this year the company expects to complete one 18-in. continuous billet mill which has already been started.

Wisconsin Steel Co.

The Wisconsin Steel Co., Chicago, has under construction at its steel works, located at South Chicago, two additional 100-ton open-hearth furnaces which it is expected will be ready for operation about the middle of this year. No other construction is contemplated this year.

Other Steel Works Additions

The Lukens Steel Co., Coatesville, Pa., last year installed a new 84-in. 4-high tandem plate mill, which has a capacity of approximately 4000 tons per month.

The Gulf States Steel Co., at its Alabama City, Ala., works, plans to install this year four 900-hp. boilers; two 60,000-cu. ft. per min. turboblowers; electric generators of 10,000 kwhr. capacity, together with condensers, water supply reservoir and standpipes. The company also expects to completely electrify the drives on the present rod mill.

The Jessop Steel Co., Washington, Pa., last year installed a 10-in. mill and cold rolling mills which are now in production. A new pickling shop was erected and the electric furnaces department has been considerably expanded.

The Firth-Sterling Steel Co., McKeesport, Pa., has added a Swindell annealing furnace to its equipment during the last year and contemplates adding more units during 1928.

The Laclede Steel Co., St. Louis, last year completed a 5-stand, 4-high continuous 10-in. finishing mill which supplants a 5-stand, 2-high, 10-in. looping mill.

Blast Furnace Construction

ADDITIONS to capacity last year were limited entirely to enlarging and rebuilding old blast furnaces. Some of the improvements reported are as follows:

The Hamilton Coke & Iron Co., Hamilton, Ohio, succeeded the Hamilton Furnace Co. on May 10, 1927. The new company is now relining the blast furnaces and increasing the hearth diameter from 16 to 17 ft. The stoves are being relined to increase the heating capacity and pressure burners are to be added. Improvement of the gas cleaning process is also contemplated. There is under construction a coke plant consisting of 45 new Koppers ovens of the Becker type with complete by-product recovering plant together with a gas holder having a capacity of 5,000,000 cu. ft.

Witherbee, Sherman & Co., Port Henry, N. Y., are increasing the capacity of the sintering plant by the addition of two pans. When this is completed, probably in February or March, the total sintering capacity of the company is expected to be about 2000 to 2200 tons per day.

The Hanna Furnace Co., Cleveland, made several improvements during the year to its blast furnace plant at Detroit, Mich. A new two-strand pig machine was erected and slag pits were installed at both furnaces. New open top pig iron ladles were provided, these having a capacity of 90 tons or sufficient to hold the entire furnace cast. A crane was installed to serve the pig machine and pouring stand and a crane house was erected. An electric locomotive was purchased to handle the ladles.

The Reading Iron Co., Reading, Pa., enlarged the hearth of its Keystone furnace and rearranged the tuyeres, thus increasing the production by about 25 per cent. A new sintering plant was installed at this furnace for treating magnetic concentrates from the company's mine at Wharton, N. J.

The Zenith Furnace Co., Duluth, Minn., has contracted for 41 Koppers coke ovens with a capacity for

carbonizing 1000 tons of coal per day. Contracts have also been let for two 10-ton coal bridges and for building an extension to the company's coal dock. It is expected that the new coke ovens will be ready for operation by next fall. It is stated that the improvements will involve an outlay of between $2,000,000 and $3,000,000.

The Toledo Furnace Co., Toledo, Ohio, started the erection last year of a 10,000-hp. boiler plant which is nearing completion. This has three units fired with blast furnace gas and two stoker-fired units. This company during the year installed a second 10,000-kw. turbogenerator in its power plant.

The Shenango Furnace Co., Pittsburgh, completed and put into operation a modern, thoroughly equipped, ingot mold foundry on its blast furnace property at Sharpsville, Pa. This is equipped to turn out 20,000 tons or more of ingot molds per month, taking molten metal from the furnaces.

Additions to Rolling Mills

MOST of the increased capacity for rolling steel was made last year by steel-making companies and details of these improvements are included under the individual reports of such companies. Only a few separate reports were received as follows:

Reading Iron Co., Reading, Pa., placed in operation last year a 16 in.-12 in. Belgian mill for rolling skelp up to 8 in. wide. This mill is equipped with automatic flying shears, weighing devices, etc. The roughing and finishing stands are motor driven and the mill will have a production of about 2500 tons of wrought iron skelp per month. This new mill takes the place of the one at Columbia, Pa., which has been abandoned. A new boiler house at the company's tube works department was completed and placed in operation in 1927. A complete new galvanizing department, including a finishing department for threading and finishing galvanized pipe, is scheduled to be completed this year.

The Oliver Iron & Steel Corporation, Pittsburgh, rearranged and added to its equipment last year for the manufacture of a full line of telephone, telegraph, electric railroad and power construction material.

Extensions to Foundries

FROM reports received, improvements and additions of any consequence to foundries were meager last year. A summary of the reports is as follows:

The Eastern Steel Castings, Newark, N. J., made last year general improvements on its open-hearth furnace for the purpose of making it more suitable for duplexing with the electric furnace. There was also installed sand handling and conditioning equipment serving the foundry by the overhead hopper system direct to the molding machines. A complete floor roller transit and storage conveyor system serving the foundry's entire molding department was added. A special high-speed monorail pouring equipment was also completed, and the chemical and physical laboratory including research department was enlarged. There has been installed a complete roller conveyor system throughout the cleaning department for the continuous movement of castings from the shake-out department to the shipping department.

The Bonney-Floyd Co., Columbus, Ohio, added a 15-ton basic open-hearth furnace to its melting department which gives the company two 15-ton furnaces and two 3-ton acid electric furnaces for its equipment.

The Reading Steel Casting Co., Reading, Pa., expects to purchase during 1928 about $15,000 to $20,000 worth additional machine tools.

The Adirondack Steel Foundry Corporation, Watervliet, N. Y., expects to install in 1928 a small electric furnace for making alloy steel castings.

Sales of Electric Furnaces Not Large in 1927

A SATISFACTORY and complete review of the electric furnace steel industry for 1927 is impossible—due to inability to secure adequate information. Fewer data are available this year than last. Therefore only a partial picture of the general situation can be presented. Such information as is available is based entirely on furnaces sold during 1927.

Duplication of records in recent years is reported by the Pittsburgh Electric Furnace Corporation, Pittsburgh, which sells the Moore or "Lectromelt" furnace. This company states that 25 furnaces of commercial size for use in the domestic iron and steel industry were sold last year. This compares with 18 furnaces in 1926, with 26 in 1925 and with 24 in 1924. There have also been sold eight laboratory size furnaces and six special furnaces which are credited to the ferroalloy and refractory industries.

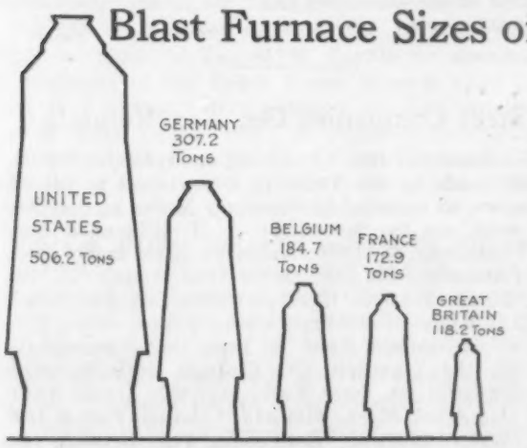
The Pittsburgh company reports that 10 furnaces have been sold for use in foreign countries. This is stated to have been "the most interesting development, all furnaces shipped abroad being in the upper range of sizes built by the company."

The Greene Electric Furnace Co., Seattle, Wash., sold one furnace in 1927 and installed two.

The development on a commercial basis of the high-frequency electric furnace seems to have made progress. The Ajax Electrothermic Corporation, Trenton, N. J., states that several commercial furnaces of 100 to 150 kw. capacity have been sold for use in melting ferrous and non-ferrous metals in England, Sweden, France and Germany. Designs are completed for a 1-ton steel melting furnace. Two 60-kw. furnaces are in use for experimental work in American laboratories.

Unofficial information is conflicting as to the sales of other furnaces. Including the Heroult and Swindell furnaces reported sold from the information available it seems that a fair estimate of the total number of electric furnaces sold last year was not more than 30.

Blast Furnace Sizes of World's Leading Iron Producers



OUTPUT of pig iron by the five principal pig iron producing countries in 1927 showed clearly the variation in size of their average stacks. Dividing total production during the major portion of the year by the average number of furnaces in blast, and the number of days covered in each case, the results are shown in the diagram. German furnaces are averaging larger than formerly, due to recent additions of several stacks comparable in size with current practice in the United States. In the remainder of Europe, however, the size is relatively small. It compares with what the United States was using 30 years ago.

Heights in the diagram are proportional to the average daily tonnage outputs of blast furnaces in the several countries.

Reduction of 20 Per Cent in Steel Export Rates Becomes Effective

WASHINGTON, Jan. 3.—Railroad rates on iron and steel products for export through Atlantic ports from Central Freight Association and Trunk Line territories were reduced 20 per cent, effective midnight, Dec. 30. The new tariffs of the carriers became operative as the result of the action of the Interstate Commerce Commission at a conference on Friday of last week refusing to suspend the schedules. Generally, the reductions amount to approximately $1 per ton. Indicative of the reductions per 100 lb. are the following: Pittsburgh-New York rate, from 25.5c. to 20.5c.; Pittsburgh-Baltimore, from 22.5c. to 17.5c.; Pittsburgh-Philadelphia, from 23.5c. to 18.5c.; Chicago-New York, from 42.5c. to 34.5c., the latter being a cut of $1.60. The schedules are filed as "experimental tariffs" and are intended to stimulate exportation of American iron and steel products. Should the schedules prove effective in this direction it is understood that they will be allowed to remain in effect. Otherwise they will be canceled by the carriers after one year. The tariffs provide for an increase of 25 per cent in the carload minimum weight, going to 45,000 lb. from 36,000 lb.

The carriers were joined by the United States Steel Products Co., exporting subsidiary of the United States Steel Corporation, and independent steel producers in the Pittsburgh and surrounding districts in asking the commission to permit the schedules to become operative. The tariffs were opposed by the Bethlehem Steel Co. and other Eastern steel makers, together with farmers' organizations of Kansas.

Ask Reconsideration of Pipe Rates to Southwest

WASHINGTON, Jan. 3.—Reconsideration of the rates prescribed on wrought iron and steel pipe in its decision in the Consolidated Southwestern cases is asked in a petition filed with the Interstate Commerce Commission by the Prairie Pipe Line Co. and the Prairie Oil & Gas Co. It is asserted that the bases prescribed bring about large increases in the rates on pipe and fittings from all producing points to destinations in the Southwest. The recent oil development in western Texas, the petition says, would be greatly hampered by the increases proposed in transporting pipe and other supplies into that section of the country.

The average of the present rates from Chicago to Kansas, Oklahoma, Arkansas, Louisiana and Texas, the petition declares, is 60.5c. per 100 lb., while it would be 71.5c. under the proposed rates. From St. Louis, the average present rate to the five States is 52.6c., which would be increased to 60.2c. The average of the present rates from Memphis is 48.5c. and would be increased to 54.6c. The average rate from Pittsburgh to Kansas, it is pointed out, would be reduced 3c. and to Oklahoma 0.5c., but to the other three States there would be substantial increases. The average increase to Arkansas, it is said, would be 1.2c.; to Louisiana, 4.8c., and to Texas, 13.2c. Taking the five States, the present average is said to be 83.4c., and it would be 87.6c. under the proposed rates. The average of the present rates from Pittsburgh to the towns from Amarillo to Sweetwater, Tex., inclusive, is 96.9c., and would be increased to $1.032.

European Hematite Agreement Possible

HAMBURG, GERMANY, Dec. 20.—Negotiations have been instituted between the Franco-Belgian Hematite Pig Iron Association, recently reorganized, and German hematite iron producers, relative to an agreement to eliminate competition in foreign markets. Although negotiations for such agreements among producers of other grades of iron have failed, success is expected in this instance.

American Exports Have Shown Substantial Growth

WASHINGTON, Jan. 3.—In an annual review for 1927, Director Julius Klein of the Bureau of Foreign and Domestic Commerce, Department of Commerce, reports that our foreign trade has continued to show remarkable growth in spite of a general lowering of world price levels and a moderate reduction in the activity of domestic business compared with 1926 figures. "Our exports have shown a substantial growth," said Dr. Klein, "indicating a further strengthening of our position in world markets, while the maintenance of our imports at about the same high level as in 1926 indicates the general prosperity of our country."

Great progress is declared to have been made in the past in increasing the efficiency of production. This is held to be true not only of the manufacturing industries but also of agriculture. The truly encouraging feature of 1927 developments, Dr. Klein said, has been the increasing interest shown in regard to methods of improved efficiency in distribution which were said to be still relatively expensive. Dr. Klein declared that there is undoubtedly a large amount of waste which could be eliminated in these processes and that substantial progress has been made toward a more careful appraisal of costs of selling, market analyses, etc.

Fifty Per Cent Increase in Cast Iron Pipe Duty Proposed

WASHINGTON, Jan. 3.—Correspondence has been taken up with the United States Tariff Commission by American makers of cast iron pipe, who are said to have in view the filing of an application seeking an increase of 50 per cent in the present duty on that product, which now carries a rate of 20 per cent ad valorem. Imports of cast iron pipe from France has been a particular source of discussion in the domestic trade. Total imports of this product for the 11 months ended with November, 1927, amounted to 78,657 gross tons, of which 61,002 tons come from France; 14,185 tons from Belgium; 1813 tons from Germany, and 1595 tons from Czechoslovakia. During the corresponding period of 1926 cast iron imports totaled 71,779 tons, while during the 12 months of 1926 the aggregate was 83,873 tons. Of this latter quantity, France supplied 57,354 tons; Belgium, 22,248 tons; Germany, 2013 tons, and Czechoslovakia, 574 tons.

German Ore Imports Have Been Large

HAMBURG, GERMANY, Dec. 20—Imports of metallic ore in the first 10 months of this year totaled more than 20,000,000 metric tons, about double the imports of 1926. The total of iron ore imports was 14,869,957 compared with 7,429,018 tons in 1926; of manganese ore 330,400 compared with 135,583 in 1926 and of copper ore 205,411 compared with 100,538 tons in 1926. Imports of all other ores this year totaled about 170,000 metric tons.

Steel Companies Get Tax Refunds

WASHINGTON, Jan. 3.—Among tax refunds of $103,858,687 made by the Treasury Department to 240,000 taxpayers, as reported by Secretary Mellon to Congress last week, are the following: J. H. Hillman & Sons Co., Pittsburgh, $899,906; American Sheet & Tin Plate Co., Pittsburgh, $54,735; Oliver Iron Mining Co., Duluth, Minn., $56,595; Carnegie Steel Co., Pittsburgh, $38,619; Alloy Steel Corporation, Canton, Ohio, $36,623; Sloss-Sheffield Steel & Iron Co., Birmingham, $36,556; the Link-Belt Co., Chicago, $61,198; Atlas Crucible Steel Co., New York, $127,352; Union Twist Drill Co., Athol, Mass., $159,426; Colorado Fuel & Iron Co., Denver, $669,130; Harrisburg Pipe Bending Co., Harrisburg, Pa., $254,767.

JOHN S. KEEFE, PRESIDENT

Succeeds W. P. Palmer as Head of American Steel & Wire Co.—Other Changes

JOHN S. KEEFE was elected president of the American Steel & Wire Co. on Dec. 28, succeeding the late William Pendleton Palmer. Mr. Keefe had been vice-president and a director of the company since 1901, maintaining headquarters in Chicago. During the illness of Mr. Palmer in the last year he has been active in the administrative affairs of the company, dividing his time between Chicago and Cleveland. He has served as chairman of the traffic committee of the United States Steel Corporation since 1903, and this, together with earlier training in traffic management, has made him one of the best informed men on transportation problems in the steel industry.

Born at Boston on Jan. 24, 1864, Mr. Keefe attended the public schools in that city. In 1880, he went to Milwaukee, and soon after was employed by the Chicago & North Western Railroad. In 1889, he was appointed traffic manager of the Illinois Steel Co., and upon the formation of the American Steel & Wire Co., in 1899 he was made its general traffic manager, holding that position until 1901, when he was elected vice-president. Headquarters of the president of the company will remain in Cleveland, but Mr. Keefe does not plan to give up his residence in Chicago immediately.

Frank Baackes, who last week was named senior vice-president in charge of commercial matters for the American Steel & Wire Co., was made general superintendent of the company at its inception, and the following year was appointed general sales agent. He was later elected vice-president and general sales agent. He was born in Germany in 1863 and came to this country in 1889. He was first employed by the H. P. Nail Co., Cleveland, and in 1894 was in charge of the erection of a wire plant at Beaver Falls, Pa., for the Hartman Steel Co. He was instrumental in the organization of the Salem Wire Nail Co., Salem, Ohio, in 1895, remaining with that company as superintendent and general manager until its absorption by the American Steel & Wire Co. of Illinois in 1897, of which he was general manager until the organization of the present company.

D. A. Merriman, Chicago, has been made general manager of sales and a director of the American Steel & Wire Co. He began his career with the Ludlow-Saylor Wire Co., St. Louis. Resigning as secretary of that company in 1893, he became manager of the Consolidated Steel & Wire Co., in which capacity he had charge of sales, traffic and mills. In 1899, when the Consolidated company was merged in the American Steel & Wire Co. of Illinois, Mr. Merriman went to Chicago as manager of sales for the new company. In 1900, he located in Seattle as president and treasurer of the Puget Sound Wire & Steel Co. When that company was acquired by the American Steel & Wire Co. in 1902, he returned to Chicago as assistant general manager of sales for the latter. He is serving his second term as president of the American Hardware Manufacturers' Association.

Henry A. Barren, the new vice-president in charge of operations of the American Steel & Wire Co., has been general superintendent since 1924. His first employment was with the old Cleveland Rolling Mill Co. at Newburgh, Ohio, when he was 15 years old. Entering Ohio State University in 1882 he spent three years on a special course in engineering and drafting, returning to the rolling mill as a draftsman. In 1891, he became master mechanic of the plant, retaining that position when it became the Newburgh Steel Works of the American Steel & Wire Co. He was made superintendent of the plant in 1901, retaining that position until Jan. 1, 1912, when he was appointed general superintendent of the company's steel works and blast furnaces in the Cleveland and Pittsburgh districts. He held this position until he became general superintendent for the company.

C. F. Blackmer has been made superintendent of wire mills for the American Steel & Wire Co. He has been active in operating capacities in the steel wire industry since 1898 and, like Mr. Keefe, the new president of the company, was originally a railroad man. Born in Worcester, Mass., he was only eight years old when his family went West and located in Colorado Springs, Colo. He grew up in that city and attended Colorado College, Colorado Springs. For the next few years he was in the employ of the Midland Terminal Railway in Cripple Creek and in 1898 went to work for the Washburn-Moen Mfg. Co., Waukegan, Ill., now the Waukegan works, American Steel & Wire Co. He was assistant superintendent of that works in 1922, when he was transferred to Duluth, Minn., to take charge of the construction of the wire plant of the Minnesota Steel Co., of which he became superintendent. He held that position until early in 1925, when he was appointed assistant manager of mills in the Pittsburgh district, embracing the mills at Farrell, Rankin, Braddock, Donora and Allentown, Pa., with headquarters in Pittsburgh. The day he was to have taken that position, George Jewett, Pittsburgh district manager, died and Mr. Blackmer was named to succeed him. In his new capacity Mr. Blackmer will be located in Cleveland.

Leslie J. Gray, who has been appointed assistant to the president, has been assistant to the general superintendent for 15 years. He entered the employ of the company more than 25 years ago in the office of the head of the operating department in Pittsburgh and was transferred to Cleveland when the office was removed there about 18 months ago.

Koppers Co. Buys Coal Properties in West Virginia

The Koppers Co., a subsidiary of the United Gas Improvement Corporation, has purchased the Houston Coal & Coke Co., Houston Collieries Co., Keystone Coal & Coke Co., King Coal & Coke Co., and the Tidewater Coal & Coke Co., all located in West Virginia and covering approximately 27,000 acres for $20,000,000. The new owner proposes to ship coal to New Haven., Conn., via Hampton Roads in 3000 ton colliers. If deeper water is provided by dredging at New Haven, larger boats will be used.

It is expected the Koppers Co. this year will become an active competitor of the New England Coal & Coke Co. and the Providence Gas Co., both of which have dominated the New England by-product foundry and domestic coke market.

Decline in Steel Shipments on Mississippi River

The Mississippi-Warrior (Federal barge) Service handled less iron and steel traffic between St. Louis and New Orleans in the first 10 months of 1927 than in the corresponding period in 1926, according to a statement supplied to THE IRON AGE by the Mississippi Valley Association, St. Louis. Shipments of bars, sheets and structural material totaled 15,223 tons in the 1927 period, as compared with 22,854 tons in the corresponding period in 1926. The movement of pipe in 1927 totaled 12,757 tons, as against 14,453 tons in 1926. No shipments of pig iron and steel blooms were reported in 1927, while 57 tons was handled in 1926. The movement of track material, however, showed a gain, totaling 686 tons for the first 10 months of 1927, as against 272 tons in the corresponding period of 1926.

CONTENTS

January 5, 1928

Steel Trade Looks to 1928 to Compensate for 1927 1
Where Steel Went in 1927 6
Improvement in Steel Trade Forecast for 1928 10
Aircraft of Increasing Importance to Metal Industries....14, 17
Trends of Iron and Steel Consumption 16
Power Farming Demands New Materials 18
What Outlook for the Average Manufacturer? ..20, 22, 24, 25
Migration of American Industry 27
Steel Scrap in 1927 Was $3.35 Below 8-Year Average....30, 54
American Foundries Through European Eyes 31
Over-Expansion in Steel Foundries 35
Changes in Open-Hearth Design and Practice in 1927..... 37
Unprofitable Year in Cast Iron Pipe 39
Machine Tool Problems Working Out 40
Moderate Building Increase Is Forecast 43
Bridge Construction Gained 70 Per Cent 44
Better Automotive Outlook for 1928 .....45, 46
Much Steel Used in Oil Fields 47
Better Prospects for Steel Jobbers 48
Railroad Purchases Take Less Steel 49
High Lights of 1927—Metal Trades in Review 50
Unemployment—a New By-Product of Prosperity 52
Japan a Growing Producer of Steel 55
Merchant Furnaces and the Foundry Industry 60
Better Marketing Is Steel Need 62
New Records in World Iron and Steel Output 67
Non-Ferrous Metallurgy and Markets Reviewed 69, 72
Further Gain in Water Shipments 74
Development of Continuous Sheets 77
Less New Capacity in 1927 78
Pig Iron Production in December and Year 92
Iron and Steel Prices for Sixteen Years 111
Charts of Iron and Steel and Non-Ferrous Prices 121, 125

Editorials 88
Iron and Steel Markets 94
Obituary 93
Comparison of Prices 95
Non-Ferrous Metals 108
Prices, Raw and Finished Materials..97, 99

This Issue in Brief

New records set in world output of iron and steel. Pig iron production was 84.3 million gross tons, a gain of 7.6 millions over 1926. Steel output was 98.2 million gross tons, 6.4 millions over 1926.—Page 67.

Forecasts large building expenditure in 1928. Construction authority believes the total will reach seven billion dollars. 1927, with a total of 6.8 billion dollars, was only 2 per cent under 1926, the record year.—Page 43.

Prosperity of essential industries depends upon absorption of surplus labor by the luxury industries. Unless the labor released by high-production machinery finds gainful employment elsewhere, buying power will be curtailed, says industrial engineer.—Page 53.

Industry is migrating to the Indiana-Ohio-Michigan section. The march of industry is not necessarily westward, for the West, as well as the East, has contributed to the industrial growth of these three States. The center of industry is now near Columbus, Ohio.—Page 30.

Handling materials by machinery, rather than by men, characterizes American foundries, says foreign foundryman. Americans have been quick to sense the savings to be made by mechanical-handling, inasmuch as more than 100 tons of materials must be handled for every ton of castings produced. —Page 33.

Smaller enterprise has as good, if not better, possibilities for reduction of real costs than has the very large establishment. Overhead sometimes gets topheavy in the big organizations. The small manufacturer has better control of labor, and can adjust his product and manufacturing processes more quickly and economically to changes in market conditions.—Page 21.

Leadership by the ablest men is the greatest factor in American industrial supremacy, says foreign manufacturer. Here, with freedom from castes, the fittest naturally rise to the top. Europe is hampered by the selection of leaders by birth, rather than ability.—Page 32.

Automotive industry may have greatly increased output in 1928. A production of 4.5 to 5 million vehicles is predicted. The previous record was made in 1926, with slightly less than 4.3 millions. 1927 output was 3,357,000.—Page 45.

Losses are only increased by clinging to the idle hope that peace-time volume will fill up war-time excess plant capacity. Economic position of industry will be strengthened by scrapping surplus, obsolete equipment, and abandoning unprofitable and unnecessary manufacturing capacity.—Page 42.

No business, small or large, can be conducted efficiently without a budget. The small business can install a budget more easily than can a large one. It will then have facts, rather than mere opinion, by which to chart its course.—Page 26.

Keep your gains or losses on material purchases in a separate account. Speculations in materials should not be permitted to throw the operating account and the cost system out of gear, but should be entered directly in the capital account.—Page 26.

"Finance" may take in its sails in 1928, while "industry" expands, reversing the experience of 1927. Business may expand in 1928, in spite of some recession in stocks and bonds, says Dr. Haney. Deflation of "finance" will be brought about by higher interest rates.—Page 12.

Demand for better steel has been a blessing in disguise to steel makers. The standards of making steel have been raised so much in recent years that tonnage producers are now turning out steel which, not many years ago, would have been furnished by a maker specializing in high grade steel. —Page 38.

Should steel contracts be made binding? Sellers declare that profits are dangerously low and that they need the protection of contracts fixed both as to price and tonnage. But purchasing agent declares that in present era of short term buying industral purchasers need the cooperation the current form of contract gives them.—Page 62.

Brighter prospects for steel jobbers in 1928. Mills have found that small orders are costly to handle, and the tendency is to let this business go to the jobber.—Page 48.

Early improvement in general business is forecast by Dr. Haney. The P-V Line points upward. Commodity prices are not likely to show a sharp advance nor a large decline. They may advance somewhat in the early part of 1928, then recede a little, and then show irregular recovery.—Page 77.

1927 rolled steel output was 8 per cent below 1926, the record year. Estimated output 32,039,000 gross tons. Building construction was greatest consumer, taking 22 per cent of total. Railroads took only 19 per cent, as contrasted with 23.5 per cent in 1926.—Page 6.

1927 pig iron output 7.8 per cent under 1926. Production was 36.4 million gross tons. Steel ingot output totaled 43,250,000 gross tons, 8 per cent under 1926, the record year.—Page 3.

ESTABLISHED 1855

THE IRON AGE

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Steel Marketing in 1928

CLEARLY a pivotal point in steel trade prosperity in 1928 will lie in marketing practices, which are to undergo an interesting and indeed crucial test. Tonnage is not to be considered a market factor in the sense that obtained in the old days, when there were wide variations in output from year to year. When we see the fairly uniform production of the past five years, under variant trade conditions, we conclude that even with some slackening in general business steel tonnage would hold up quite well. On the other hand there is no visible chance that for this one year, at least, demand can so expand as to test the productive capacity. Steel ingot production last year was approximately 75 per cent of 58,000,000 tons, which was reported as "theoretical capacity" for the beginning of that year.

The tonnage of 1928 is likely to fall within such limits that it will not in itself exert much influence upon the price situation. This will have to be handled by the producers themselves, by more enlightened methods and a greater spirit of cooperation. Everything is now set at the opening of the new year for display of ability in these directions.

In five important lines—bars, shapes, plates, sheets and wire nails—price advances have been in the making, each product presenting its own case as to how soon actual invoice prices will equal the higher levels named. Thus the circumstances of substantial tests have already been set up.

Producers need to consider not only the individual attitudes of sellers as to price maintenance, but also the machinery by which prices are quoted, involving both the differentials or extras for size, gage, etc., in lines which are supposed to have a "base price," and also the extras to be charged on retail lots shipped by mills.

In some lines producers have recently proceeded by the cut and try method. Some extras for smaller quantities have been set up and shortly afterward modified, presumably on account of opposition by buyers. It ought to be found possible to develop in each line such extras as would not be onerous upon buyers and at the same time would protect producers from loss in making small-lot shipments. A difficulty in some products has been that the manufacturing consumer and the jobber are in different positions as to the quantity of a size required at one time, and thus a schedule of quantity extras that does not bother the average manufacturer may be quite objectionable to the jobber.

When, as in strips, there is a published list of size and gage extras and a wide variety of base prices is quoted in the open market, it is obvious that something is wrong. Such a list presupposes a uniform base price. By sufficiently long practice the principle has been established in some lines, notably in merchant bars. In 1926 it developed that with the existing schedule of gage differentials in sheets, related to 28 gage as base, there was more shading on the heavy than the light gages. The sheet industry thereupon set up new differentials, based on 24 gage, as of Sept. 1, 1926, and the matter was corrected.

Along these and related lines there is opportunity for much constructive effort in 1928. Improvement in steel marketing conditions should come from within the steel producing industry.

How Thrifty Are We?

SAVINGS of the American people in the banks and trust companies are well over $26,000,000,000, according to the savings bank division of the American Bankers' Association, this amount comparing with about $24,700,000,000 a year ago. Of the addition to national savings for the year, approximately $1,300,000,000, something like $750,000,000 represented interest on the sum already on deposit, leaving only a little over $500,000,000 to represent new deposits. The gain of $1,300,000,000 is the lowest in 12 years.

It is estimated that the premiums paid in 1927 for life insurance were considerably in excess of

such payments in 1926. Building and loan savings and the purchase of corporate securities by corporate employees are also expected to show increases for 1927.

These data are becoming the subject of editorial and other comment to the effect that the American people are increasingly thrifty and are adding increasingly to their resources.

Obviously such deductions do not follow at all from the facts, which need not be questioned. A man's wealth is seldom measured by the magnitude of his bank balance. The latter is a crystallization of credit available for immediate needs. His wealth is in documents representing ownership of land, mines, buildings, factories, railroads and interests in going business concerns.

Even the deposits which give to some people credit to their account in a savings bank must be invested by the bank, directly or indirectly, in some form of real wealth. It is only the forms of real wealth that appear in a national inventory. The deposits in savings banks, or in any other banks, do not so appear at all. The answer to the inquiries whether we are nationally gaining in wealth, whether we are saving enough, whether we are sufficiently thrifty, etc., must therefore be how much we are gaining in inventory. Unfortunately the status of economic science does not permit the giving of such an answer, at least not with precision and certainly not year by year.

We may have such a paradox as gaining in savings bank deposits, life insurance, etc., and losing in national wealth. The explanation of this would be that savings bank deposits are the expression of the thrift of a certain class of people. It may be that one class is thrifty while another class is not. Indeed, one class may gain at the expense of another class. The factors that are commonly recognized as being evidences of thrift may not be so at all in national terms.

World Steel Output at New High

NEW records in the world's pig iron and steel output, and in exports as well, were made last year, due to the expansion of the industries of Europe. Several features stand out in the survey, found on other pages, covering all producing countries.

Pig iron no longer lags. At 84,280,000 gross tons for the year, the 1913 or pre-war record is exceeded for the first time, the margin being about 6,560,000 tons, or nearly 8.5 per cent. The 1927 total was larger than that of 1926 by 6,610,000 tons.

In steel the new world total was 98,200,000 tons, topping the previous record of 91,790,000 tons in 1926 by 6,410,000 tons, or about 7 per cent. The growth in the world's steel needs is emphasized by the contrast between last year and 1913. Steel production is 31 per cent, while pig iron is only 8.5 per cent, larger than that of the pre-war year.

Expansion in Europe—not in the United States—accounts for the 1927 records. While American production shrank, the European output was about 10,000,000 tons larger in both pig iron and steel than in 1926, more particularly due to increases in Germany and Great Britain.

For the second time since the war, exports of the six leading nations were larger than in 1913, establishing a new record at 20,590,000 tons. This compares with 17,710,000 tons in 1926 and contrasts with 16,190,000 tons in 1913. Especially interesting is the fact that, although imports for all the six countries were at a new high for the year, the excess of exports over imports was back to the level of the pre-war year.

With the European industry on a more nearly normal basis, with the outlook for the American industry good, and with world-wide interchange of products broader than in many years, the world's steel industry enters 1928 with brighter prospects than have marked the beginning of any year since the war.

Problems of Big and Little Business

SINCE the major articles in this Annual Review Number are written by leaders in the respective fields, it is reasonable to deduce from them broad conclusions about the condition of the metal-working industry. A review of all these contributions (together with a few which must be printed next week) shows that 1927 continued the progress toward efficient production which has marked recent history.

More rapid, more accurate machines have been built and installed and the capacity of existing plant measurably increased by refinement in detail. More power is continually being harnessed; production costs are trimmed by labor-saving devices of many sorts. The total result is that most American manufacturers can produce much, can easily produce more than they can sell easily—in other words our manufacturing capacity is over expanded. Plant and labor are working less than full time.

Hence the importance of salesmanship. Engineers and production men who can increase output are plentiful; but sales managers who can dispose of the output in old fields or recognize commercial possibilities in new ones are not so plentiful. Intense competition for the existing market has frequently driven prices down to a point where profits are unsatisfactory. Even though production costs are lowered, selling costs are increasing. Market investigations, sales promotion service work, and all the expensive incidentals required to get and hold a customer have increased apace. Hence the development of trade associations, so that whole industries can meet competition shoulder to shoulder. Hence the invention of "consumer credit" or instalment buying of luxuries under a new name.

Here are our two problems in a nutshell: Surplus manufacturing capacity; excessive selling costs.

They involve a third, which just recently has been attracting attention, namely, underemployment. With every labor-saving refinement in a mechanism comes a decreased demand for labor—usually it is the least skilled that is eliminated. An unexampled amount of road building and engineering projects have absorbed much common labor, but with the continuing "mechanization" of construction plant, of the farm, the coal mine, the factory and the home, there are fewer and fewer places for him to turn his hand. It is to be hoped

that this condition will not work back through the higher grades of labor, with decreased consumer income and decreased consumer credit, in a vicious cycle.

Stating these problems by no means implies a pessimistic outlook. Knowing the difficulties in advance, a wise man can lay plans to avoid them or surmount them. And these problems are not exclusively the problems of big business. The problems of the large corporation and of the small independent are different in degree rather than in kind.

In the past the small manufacturer has frequently been obscured by the glare of the giant concern. Mr. Ford and Mr. Schwab are always news. Furthermore, statisticians are fond of pointing out that 70 per cent of the output in such and such an industry comes from 13 per cent of the plants. The implication is that the 30 per cent of output and the 87 per cent of plants are quite unimportant. As a matter of fact their extinction would precipitate a most acute industrial and sociological crisis.

While it is impossible to say where the small business ceases to be small and becomes big, an organization whose manager can call the employees by name is doubtless to be classified as "small." Many things about such an enterprise compare favorably with the great industrial giant. It may be equally efficient and prosperous. It is far more flexible, and it may develop to the highest degree individual initiative and satisfaction in a sound achievement. The problems and successes of the small business man are worth more attention than they have been given in the past, for these enterprising and independent Americans are the salt which savors the whole mass.

Billion-Ton Mark in Pig Iron

BEFORE the end of 1928 the United States will have made one billion gross tons of pig iron. At the average rate of the past five years it would require only 27 years to make this amount, but 63 years ago a million tons was made in a year and 29 years ago ten million tons. Having come years ago to occupy a very wide field, iron tonnage has not increased of late by the percentage rates that used to obtain.

The Abram S. Hewitt rule of doubling in pig iron tonnage every ten years worked very well through 1910, but since that year gains have been smaller. The following table gives an interesting retrospect, showing ten-year totals of production, with percentage increases one decade over the preceding:

Ten Years Through	Production, Gross Tons	Increase, Per Cent
1867	8,760,578	.....
1877	19,984,735	128.2
1887	42,484,217	112.6
1897	82,236,958	94.0
1907	181,470,757	120.6
1917	284,708,343	56.9
1927	335,250,000	17.7

No geometrical rate of increase could be followed indefinitely. Naturally when the industry became large it had to slow down in its percentage gains, but another principle also operated. For a long time there was little if any improvement in quality. Then as a large proportion of the pig iron came to be put into steel instead of into iron castings, and the steel came to be improved, the strength and service per ton increased, and it is now increasing. The total usefulness, therefore, is not to be measured merely by tons. The increase is much greater than the tonnage increase.

A corresponding comparison of production of steel ingots and castings is as follows:

Ten Years Through	Production, Gross Tons	Increase, Per Cent
1907	153,361,430	230.7
1917	293,799,823	95.7
1927	397,800,000	35.4

SHEET MERGER EFFECTED

Empire Steel Corporation Is Formed by Consolidation of Six Ohio Companies

THE Empire Steel Corporation has been incorporated to acquire and combine the plants of six Ohio sheet mills, for the merger of which plans have been under way for some time. The combined assets of the merged companies are approximately $20,000,000. The companies to be merged are the Mansfield Sheet & Tin Plate Co., Mansfield; the Ashtabula Sheet Steel Co., Ashtabula; the Empire Steel Co., Cleveland, and the Falcon Steel Co., Thomas Sheet Steel Co. and the Waddell Steel Co., Niles.

W. H. Davey, president Mansfield Sheet & Tin Plate Co., and the Ashtabula company, who has taken a leading part in bringing about the merger, will be president and managing executive of the new corporation. Others officers have not been selected. The location of the headquarters has not been definitely decided upon, but for the present the main office will be in Mansfield.

Approval of the merger is still to be obtained from the stockholders of the different companies, and when this is obtained the final work of consolidation will be carried out. The new company will have 60 mills, 58 being sheet mills and two, jobbing mills, and will have an annual capacity of 400,000 tons of finished products. It will also have four 75-ton open-hearth furnaces, a 32-in. blooming mill and a 24-in. sheet bar mill, these steel-making facilities being a part of the plant of the Mansfield Sheet & Tin Plate Co. All the other companies going into the combine have non-integrated plants.

The new corporation will have 550,000 no par common shares and 150,000 preferred shares of $100 par value. It has secured a charter in Ohio, and its incorporators include W. H. Davey, J. D. Waddell, Niles, president Waddell Steel Co.; A. W. Wheatley, Lima, president Empire Steel Co.; W. A. Thomas, Youngstown, Thomas Sheet Steel Co.; Lloyd Booth, Youngstown, president Falcon Steel Co.; M. C. Robinson, Ashtabula, a director of the Ashtabula Sheet Steel Co.

The tentative balance sheet of the Empire Steel Corporation as of Oct. 31, shows current assets of $3,682,820, property and equipment, $15,759,589, and other assets, $236,958. The current liabilities were given as $1,255,907, and other liabilities include first mortgage bonds, $3,650,000, and paid in surplus, $2,062,432. The capital stock to be presently issued, under the plans of the merger, includes $7,430,200 in preferred stock and 206,243 shares of common stock at a declared value of $25 a share, or a total of $5,156,081.

Ground was broken Dec. 27 for two steel buildings that will house new equipment to be installed by the Gulf States Steel Co., at its Alabama City, Ala., works. The equipment was listed in THE IRON AGE of Dec. 29, 1927, page 1794.

FABRICATED STRUCTURAL STEEL

Awards Total 36,000 Tons, With 11,500 of New Projects Up for Bids

In the last week of the year structural awards amounted to 36,000 tons, including 14,000 tons for the Chicago *Daily News* building, and 3500 tons for a bridge over the James River. Fresh projects totaled only 11,500 tons, of which the largest is 4300 tons for the Woolworth Building in Chicago. Awards follow:

NEW YORK, 5000 tons, bank building at Wall, Hanover and Beaver Streets, to Post & McCord.

NEW YORK, 1500 tons, addition to Bellevue Hospital, to Levering & Garrigues Co.

BROOKLYN, 1500 tons, theater, to Hedden Iron Construction Co.

BROOKLYN, 500 tons, building for E. R. Squibb & Sons, to McClintic-Marshall Co.

UTICA, N. Y., 500 tons, Utica State Hospital, to an unnamed Pittsburgh fabricator.

CLEVELAND, 340 tons, pathological hospital for Western Reserve University, to National Iron & Wire Co.

NORFOLK, VA., 3500 tons, James River Bridge, to Virginia Bridge & Iron Co.

GREENVILLE, N. C., 165 tons, building for Greenville Foundry Co., to an unnamed local fabricator.

NEW ORLEANS, 200 tons, building for Standard Oil Co. of Louisiana, to an unnamed local fabricator.

LAUREL, MISS., 350 tons, addition to Mason Foundry Co. plant, to Ingalls Iron Works Co., Birmingham.

BIRMINGHAM, tonnage being estimated, additions to city schools, to Southern Steel Works.

CHICAGO, 14,000 tons, building for *Chicago Daily News*, to American Bridge Co.

CHICAGO, 600 tons, shed for Bohnsack Brick Co., to Midland Structural Steel Co. and Blaw-Knox Co., local.

HENRY COUNTY, IOWA, 325 tons, highway bridge, to Clinton Bridge Co., Clinton, Iowa.

JOHNSON COUNTY, IOWA, 250 tons, highway bridge, to Des Moines Steel Co., Des Moines.

STATE COLLEGE, PA., 860 tons, recreation building for Penn State College, to H. K. Ferguson Co.

PITTSBURGH, 1000 tons, two tow-boats for Union Barge Line, to Midland Barge Co., Midland, Pa.

NEW ALBANY, IND., 600 tons, four barges for E. T. Slider, to Midland Barge Co.

ST. MARYS, W. VA., 2000 tons, bridge over Ohio River, to American Bridge Co.

CINCINNATI, 2000 tons, six barges for Barrett Line, to Riter-Conley Co.

LOS ANGELES, 550 tons, science building for University of California, to Baker Iron Works.

HOLLYWOOD, CAL., 450 tons, First National Bank, to Baker Iron Works.

REDLANDS, CAL., 100 tons, school auditorium, to Baker Iron Works.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

ST. ALBANS, VT., 350 tons, three State bridges.

BAYONNE, N. J., 100 tons, transmission towers for Standard Oil Co. of New Jersey.

ATLANTIC CITY, N. J., 150 tons, bridge for New Jersey State Highway Department.

LANCASTER, PA., 700 tons, passenger station for Pennsylvania Railroad.

PENNSYLVANIA RAILROAD, 350 tons, bridges in Virginia.

CINCINNATI, 1300 tons, Eighth Street viaduct, general contract to Foldwell & Ahlskog, Chicago.

ANDERSON, IND., 500 tons, storage building, for Delco Remy Corporation.

CHICAGO, 4300 tons, Woolworth Building.

CHICAGO, 2500 tons, apartment building on Burton Place.

SAN BERNARDINO, CAL., 300 tons, Victorville bridge; F. L. Holser, Los Angeles, general contractor.

INDIAN COVE, IDAHO, 100 tons, Snake River bridge, Perham & Rowe, St. Anthony, Idaho, general contractor.

LOVELOCK, NEV., 600 tons sheet steel piling for Orena Dam; Jasper-Stacy Co., general contractor.

SWAN VALLEY, IDAHO, 300 tons, Snake River bridge; bids Jan. 10.

RAILROAD EQUIPMENT

More Freight Cars Ordered—Three Roads Buy Total of 108 Locomotives

The Southern has ordered 68 locomotives, the Seaboard Air Line 25 and the Texas & Pacific 15, the largest volume of locomotive buying in some time. The Southern will build 750 freight cars in its own shops, in addition to 4750 cars ordered of car builders, and the Mobile & Ohio has bought 700 cars.

Atchison, Topeka & Santa Fe has ordered 100 caboose cars from the American Car & Foundry Co. and 100 extension side dump cars from the Magor Car Co.

Pittsburgh Railways have ordered 15 interurban passenger coaches from the St. Louis Car Co.

Central Railroad of Georgia is inquiring for 500 flat cars.

Texas Pacific is in the market for 10 caboose cars.

Seaboard Air Line has ordered 25 locomotives from the Baldwin Locomotive Works.

The Mobile & Ohio has ordered 700 freight cars, of which 250 box cars and 200 flat cars will be built by the Mount Vernon Car Mfg. Co. and 250 gondolas by the General-American Car Co. Six passenger cars also were awarded to the Bethlehem Steel Co.

Texas & Pacific has ordered 15 Texas type locomotives from Lima Locomotive Works, Inc.

Southern Railway System will build 500 gondola and 250 caboose cars in its own shop, the Lenoir Car Works. These are in addition to 4750 cars, which were reported awarded last week. This railroad has also ordered 55 Mikado, five Pacific and eight mallet-type locomotives from the Baldwin Locomotive Works.

Swift & Co. are inquiring for 300 steel underframes for refrigerator cars.

Illinois Central expects to make inquiry for 20 suburban coaches.

New York, Westchester & Boston has ordered 15 motor-passenger cars from Osgood Bradley Car Co., in addition to 10 reported last week.

Nashville, Chattanooga & St. Louis has inquired for two combination baggage and passenger cars and two baggage cars.

REINFORCING STEEL

Government Building in New York Takes 3000 Tons—3700 Tons in Cincinnati Viaduct

With 3000 tons for an Appraisers' Stores building in New York, the total of awards of reinforcing steel in the week was more than 6600 tons. Award is expected shortly of 3700 tons for a viaduct in Cincinnati. Awards follow:

BIRMINGHAM, tonnage being estimated, two city schools, to Connors Steel Co.

CHICAGO, 500 tons of rail steel bars, Medinah Athletic Club, to Inland Steel Co.

ST. LOUIS, 300 tons, warehouse for Stix, Baer & Fuller Co., to Missouri Rolling Mills Corporation.

NEW YORK, 3000 tons, United States Appraisers' Stores; from Turner Construction Co., general contractor, to Jones & Laughlin Steel Corporation.

ELIZABETH, N. J., 800 tons, concrete decks for bridge over Arthur Kill from Elizabeth to Howland Hook, S. I.; from Albert Volk, Inc., general contractor, to E. T. Edwards, Columbia, Pa.

SILVIS, ILL., 100 tons of rail and billet steel bars, building for Swift & Co., to Olney J. Dean & Co.

PITTSBURGH, 200 tons, Grant Building, to Truscon Steel Co.

LOS ANGELES, 1740 tons, for Puddingstone Dam, to Soule Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

CLEVELAND, 400 tons, sales and service building for Packard Motor Car Co.

CLEVELAND, 500 tons, tunnel work for Cleveland Union Terminals Co.

TOLEDO, 400 tons, store building for Lamson Brothers.

CINCINNATI, 3700 tons, Eighth Street viaduct, general contract to Foldwell & Ahlskog, Chicago.

TEXARKANA, ARK., 225 tons, Union Station.

Iron Output at Low for the Year

Estimated December Daily Rate Fell 1319 Tons or 1.5 Per Cent from November—No Gain or Loss in Furnaces —Year's Total at 36,232,300 Tons

WITH a large proportion of the data estimated by the producing companies, figures collected by wire on Tuesday, Jan. 3, show that pig iron production in December fell off from November 1319 tons per day or nearly 1.5 per cent. This compares with a decline in November of 1531 tons per day or 1.7 per cent.

The estimated December output was 2,695,755 gross tons or 86,960 tons per day for the 31 days as compared with 2,648,376 tons or 88,279 tons per day for the 30 days in November. As in 1926 so in 1927, December was the smallest month of the year.

The December preliminary estimate of 2,695,755 tons brings the year's total to about 36,232, 300 tons of coke pig iron, comparing with 39,070,470 tons in 1926, and with 36,403,470 tons in 1925.

Four furnaces were blown in and four blown out or banked during December, leaving the total active on Jan. 1 at 170 or the same as on Dec. 1. Of the four furnaces blown in last month, three were independent steel company stacks and one was a merchant furnace.

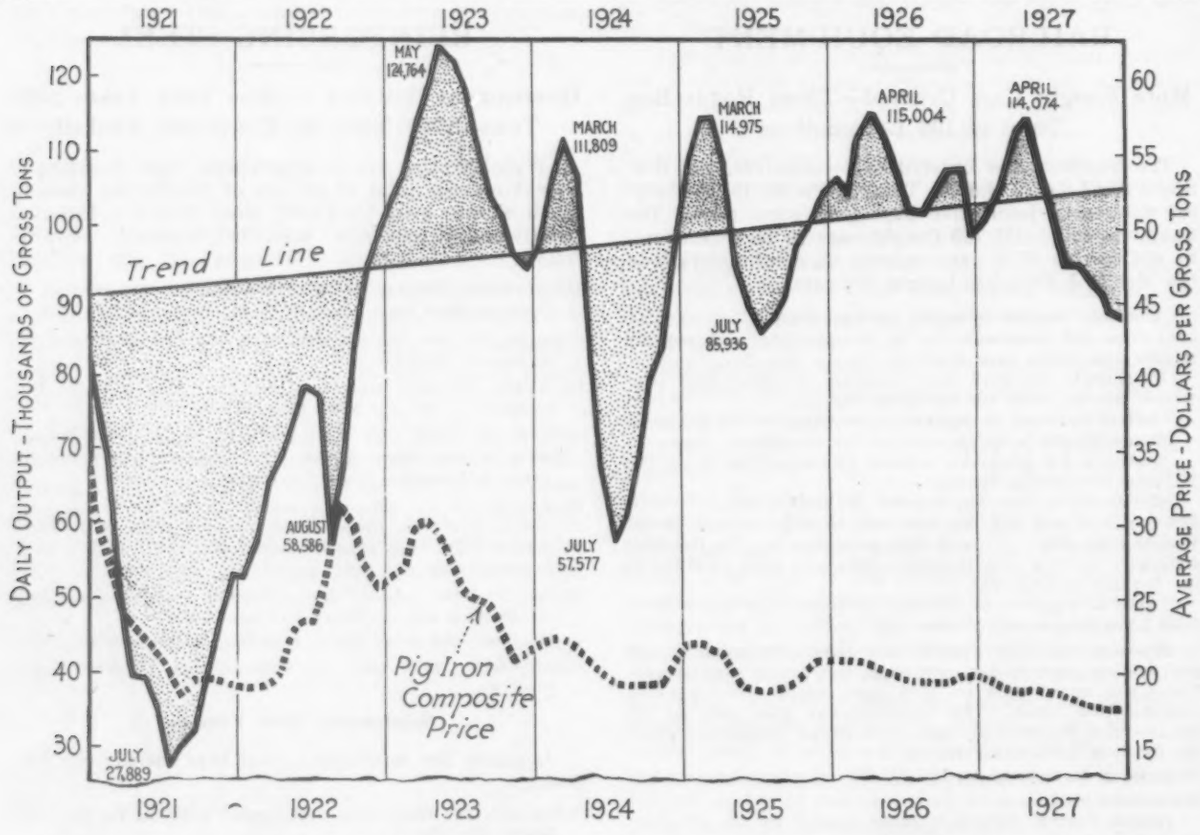
Pig Iron Production by Districts, Gross Tons

	Dec. (31 days)	Nov. (30 days)	Oct. (31 days)	Sept. (30 days)
New York and Mass.	199,726	212,778	232,422	222,485
Lehigh Valley	74,316	75,748	81,829	86,398
Schuylkill Valley	44,238	53,269	64,260	52,256
Lower Susq. and Lebanon Valleys	32,289	30,150	31,828	30,349
Pittsburgh district	523,875	495,005	540,525	555,384
Shenango Valley	58,982	64,752	77,106	83,919
Western Penna.	92,774	92,000	93,010	91,774
Maryland, Virginia and Kentucky	92,981	91,300	88,991	80,973
Wheeling district	114,030	110,055	110,222	114,357
Mahoning Valley	222,572	223,617	245,625	248,834
Central and Northern Ohio	295,179	306,395	324,793	311,141
Southern Ohio	32,413	32,750	32,954	25,636
Illinois and Indiana	537,892	508,545	506,438	533,686
Mich., Minn., Mo., Wis., Colo. and Utah	140,141	126,287	121,203	122,309
Alabama	227,775	219,478	224,533	207,363
Tennessee	6,572	6,247	8,373	8,085
Total	2,695,755	2,648,376	2,784,112	2,774,949

Production of Coke Pig Iron in United States by Months, Beginning Jan. 1, 1925—Gross Tons

	1925	1926	1927
Jan.	3,370,336	3,316,201	3,103,820
Feb.	3,214,143	2,923,415	2,940,679
Mar.	3,564,247	3,441,986	3,483,362
Apr.	3,258,958	3,450,122	3,422,226
May	2,930,807	3,481,428	3,390,940
June	2,673,457	3,235,309	3,089,651
½ year	19,011,948	19,848,461	19,430,678
July	2,664,024	3,223,338	2,951,160
Aug.	2,704,476	3,200,479	2,947,276
Sept.	2,726,198	3,136,293	2,774,949
Oct.	3,023,370	3,334,132	2,784,112
Nov.	3,023,006	3,236,707	2,648,376
Dec.	3,250,448	3,091,060	2,695,755
Year*	36,403,470	39,070,470	36,232,306

*These totals do not include charcoal pig iron. The 1926 production of this iron was 163,880 tons.



Daily Pig Iron Output in December was 1.5 Per Cent Less Than in November; Composite Price Again Decreases Slightly

Inclined line represents the gradually increasing theoretical needs of the country, and shows that production is now below the so-called normal. Dotted line represents THE IRON AGE *composite price*

One merchant furnace and three independent steel company stacks were shut down.

Possibly Active Furnaces Reduced

One Bessemer furnace of the Tennessee Coal, Iron & Railroad Co. in Alabama and the Genesee furnace of the M. A. Hanna Co. in New York have been scrapped. This reduces the number of possibly active stacks from 359 to 357.

Furnaces Blown In and Out

Four furnaces were blown in during December, as follows: The Sharpesville furnace in the Shenango Valley, one furnace at the Cambria plant of the Bethlehem Steel Corporation in western Pennsylvania, one furnace of the National Tube Co. in northern Ohio and one furnace of the Colorado Fuel & Iron Co. in Colorado.

Four furnaces were blown out or banked during December: One furnace at the Lackawanna plant of the Bethlehem Steel Corporation and one Donner furnace in the Buffalo district in New York; the Perry furnace in western Pennsylvania, and one River furnace of the Corrigan-McKinney Steel Co. in northern Ohio.

BRITISH OUTLOOK FAVORABLE

European Competition Diminishing—Year's Imports of Iron and Steel Estimated to Have Exceeded Exports

(By Cable)

LONDON, ENGLAND, Jan. 2.

THE year opens with the iron and steel markets quiet following the holidays, but prospects regarded more hopefully as Continental competition with Cleveland producers has diminished. There are 40 Cleveland furnaces in blast and producers expect to blow in additional furnaces in the near future. Hematite iron is quiet and makers are inclined to grant small concessions on large tonnages. Foreign ore continues idle.

Steel business has been quiet as most works were closed during the past week. Some makers are moderately well booked, especially on small bars, rivets, bolts and nuts. Mills rolling plates and angles, however, are insufficiently well sold to permit of full time operation.

Tin plate has been moderately active, although most works closed for a compulsory holiday under the restriction of output plan. Inquiry is good and the outlook distinctly more favorable.

Galvanized sheets are quiet and demand is confined to small lots. Japanese buying of black sheets is light.

The British production of steel ingots and castings last year is estimated at 9,200,000 gross tons and of pig iron, 7,300,000 tons. Imports of iron and steel are estimated at 4,400,000 tons and exports at 4,310,000 tons. Clyde shipbuilding last year totaled 254 vessels of 464,200 tons.

Continental markets are dull following the recent holidays and quotations are inclined toward easiness with buying light. Apprehension of a suspension of German mills is less general.

The European Rail Makers' Association has booked 60,000 tons of rails for South Africa, 75,000 tons for Argentina and 52,000 tons for Belgian railroads, all for delivery through the current year. Polish output in October was 62,000 tons of pig iron, a post-war high record, and 104,200 tons of steel ingots. Production of rolled steel totaled 87,500 tons.

Will Occupy Utica Heater Plant

The Richardson & Boynton Co., New York, manufacturer of hot air furnaces, has made an arrangement with the National Radiator Corporation by which it will occupy the plant of the Utica Heater Co. at Whitesboro, N. Y. By this deal the former company will acquire 23 acres near Utica, formerly owned by the Heater company, together with a modern plant, rail sidings, etc. The Richardson & Boynton Co. recently closed temporarily its plant at Dover, N. J.

OBITUARY

B. F. Jones, Jr.

BENJAMIN FRANKLIN JONES, JR., chairman of the board of directors Jones & Laughlin Steel Corporation, Pittsburgh, died at his home in that city Jan. 1, after an illness of two weeks. He was in his office on Dec. 17 and apparently in good health.

B. F. JONES, JR.

The corporation of which Mr. Jones was the head was founded by his father, the late B. F. Jones, more than 75 years ago. From small beginnings it has grown to its present position as one of the largest independent steel companies. Unaffected by the mergers and consolidations which have taken place in the industry in the last 25 years, the business has remained one of the outstanding examples of corporate ownership kept largely within the families of the founders.

Mr. Jones was born April 21, 1868, on the North Side, Pittsburgh, then the city of Allegheny. His early education was in private schools in Pittsburgh, after which he took a preparatory course at St. Paul's School, Concord, N. H., and entered Princeton University, graduating in the class of 1891.

Upon his return from college Mr. Jones entered the employ of Jones & Laughlin, Ltd., the name of the company at that time, as treasurer and member of the board of managers. He had previously spent much time at the mills and furnaces and had a sound working knowledge of the making of iron and steel. In 1907, four years before the death of his father, Mr. Jones became president of the company and continued in that position until the organization of the Jones & Laughlin Steel Corporation, when he became chairman of the board.

Following the example of his father, who was chairman of the Republican National Committee in 1884, Mr. Jones, Jr., had been active in politics, having served as chairman of the electoral college of Pennsylvania after the campaign of 1908. Another of his interests outside of business was art, his collection of paintings being one of the most notable in Pittsburgh. He was a member of the First Presbyterian Church, Pittsburgh, and was trustee of the Allegheny General and Mercy hospitals. Although most of his business life was devoted to the manufacture of steel, he also was a director of the Union Trust Co. of Pittsburgh and the National Union Fire Insurance Co.

His club memberships included the Pittsburgh, Duquesne, Union and Allegheny clubs of Pittsburgh; the University, Princeton, Racquet and Tennis clubs of New York; the Union Club, Cleveland; Nassau Club, Princeton, and the University Club, Chicago.

In 1892 Mr. Jones was married to Sue D. Dalzell, who survives him, together with his son, B. F. Jones, 3d, and his daughter, Mrs. J. O. Burgwin; two grandchildren, Susan and Virginia Burgwin; and his sisters, Mrs. Alexander Laughlin, Jr., Mrs. Elizabeth M. Horne and Mrs. W. W. Willock, all of Pittsburgh.

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MARSHALL W. WARREN, founder and president of the M. W. Warren Coke Co., St. Louis, and a pioneer coke dealer of the Middle West, died recently at his home in Webster Groves, St. Louis. He had retired from business several years ago.

Iron and Steel Markets

January Mill Operations Increase

Good Specifications in Sheets, Bars, Plates and Shapes—December Pig Iron Output Less—New World's Record in Steel

THE last month of 1927 was like December, 1926, in being the lowest of the year in steel production, but January operations now promise a larger rate of gain over December than the 8 per cent of a year ago. There was the difference, however, that 1926 had a definite autumn upturn, whereas last year there was a practically uninterrupted decline in output, beginning with April. How far this can now be compensated for is a matter of first interest to the entire trade.

Good specifications in the last 10 days of December, especially in sheets, bars, plates and structural material, have started mills at a fair January rate, many now having orders that will keep them going through the month. In the past few days the automotive industry has specified for January requirements of sheets and strips.

Companies reporting to the National Association of Sheet and Tin Plate Manufacturers now have about 750,000 tons of unfilled orders, the largest total on record apart from 800,000 tons early in 1920.

Price uncertainties remain, especially in view of the large amount of plate, shape and bar tonnage carried into the first quarter at 1.75c., which was the basis of coverage before the Carnegie advance of $1 a ton on Nov. 10.

Yet it is not overlooked that some forces may be working for a more stable market in the coming year. No new blast furnaces were built last year, and very little new steel capacity. Consolidations are likely to lessen the scramble for tonnage, and in the sheet industry the handling of the continuous mill patent situation may prove a constructive factor.

Pig iron production in December was 2,695,755 tons, or 86,960 tons a day, against 2,648,376 tons, or 88,279 tons a day in November. In December, 1926, the daily rate was 99,712 tons, or nearly 15 per cent more than last month's.

Four furnaces went out in December and four went in, leaving the number in blast on Jan. 1 at 170. One year previous it was 204.

For the year 1927 pig iron output was about 36,400,000 tons, with charcoal iron estimated. This compares with 39,373,000 tons in 1926.

In production of steel 1927 was fifth among the leading years. The estimate of 43,250,000 tons of ingots shows a drop of 3,700,000 tons from 1926, the high year, but 1927 exceeded the average of the four years that preceded it.

While American pig iron and steel production fell off last year, Europe added close to 10,000,000 tons of each product to its performance of 1926. We estimate the world's steel ingot output last year (21 countries) at 98,200,000 tons, or 6,500,000 tons more than in 1926, the previous record year. The pre-war record was 74,830,000 tons in 1913.

Following the placing of 11,500 freight cars in the pre-holiday week, three railroads have bought a total of 108 locomotives, the Southern ordering 68, the Seaboard Air Line 25 and the Texas & Pacific 15. The Mobile & Ohio has taken 700 cars, while the Southern has authorized the building of 750 cars in its own shops, in addition to 4750 recently placed with car builders.

Award of 14,000 tons of structural steel for the Chicago *Daily News* building brought up the total of fabricated steel contracts in the last week of the year to 36,000 tons. Only 11,500 tons in fresh projects appeared, the largest being 4300 tons for a building in Chicago. A viaduct in Cincinnati will take 3700 tons of reinforcing steel and a Government building in New York calls for 3000 tons.

Pig iron buying, largely by the automotive industry, continues heavy in the Cleveland district, and good orders were booked at St. Louis. Chicago district furnaces enter 1928 with the largest first quarter backlogs in several years. Prices show little change, but in some districts stocks of merchant iron on furnace banks are still heavy, those in the Valleys being estimated at 250,000 tons.

Heavy melting scrap has advanced 50c. a ton at Pittsburgh and 25c. at Chicago. Pittsburgh and particularly Ohio centers west of that city have been feeling the heavy diversion of scrap from Detroit to Buffalo, and dealers, fearing a shortage, have been scouring the market for material to cover sales made in December.

A 5000-ton Central Western transaction in gravel fluorspar indicates a market of $15 for good lots, or $1 a ton below recent quotations.

Apart from the H. C. Frick Coke Co., Connellsville coke operators generally are back to the November, 1917, scale of wages, which gives $5 for day labor, or $1 a day less than has been paid lately. In both coal and coke supply continues in excess of demand.

Exports of iron and steel products from the United States in 1927 were about 2,190,000 tons. This is the largest total in six years, exceeding 1926 by 1 per cent. Tin plate and wrought pipe were leading products, followed by structural material, rails and black sheets.

Imports of iron and steel into the United States in 1927 fell off 33 per cent from 1926, due mainly to a decrease of over 300,000 tons in pig iron. The total was about 750,000 tons compared with 1,111,000 tons the previous year. But rolled and finished steel increased 25,000 tons or 7 per cent over 1926.

Neither of THE IRON AGE composite prices is changed this week, pig iron remaining for a fourth week at $17.54 and finished steel for a third week at 2.314c. a lb. Both are far below last year's opening prices—pig iron by $2.17 a gross ton, and finished steel by $2.78 a net ton.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At Date, One Week, One Month, and One Year Previous

Pig Iron, Per Gross Ton:	Jan. 3, 1928	Dec. 27, 1927	Dec. 6, 1927	Jan. 4, 1927
No. 2, fdy., Philadelphia	$19.76	$19.76	$19.76	$22.26
No. 2, Valley furnace	17.25	17.25	17.25	18.50
No. 2, Southern, Cin'ti	19.69	19.69	19.69	23.69
No. 2, Birmingham	16.00	16.00	16.00	20.00
No. 2 foundry, Chicago*	18.50	18.50	18.50	21.00
Basic, del'd eastern Pa	19.50	19.50	19.00	21.50
Basic, Valley furnace	17.00	17.00	17.00	18.00
Valley Bessemer, del'd P'gh	19.26	19.26	19.51	21.26
Malleable, Chicago*	18.50	18.50	18.50	21.00
Malleable, Valley	17.50	17.50	17.50	18.50
Gray forge, Pittsburgh	18.51	18.51	18.51	19.76
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	100.00	100.00	100.00	100.00
Rails, Billets, etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Bess. billets, Pittsburgh	33.00	33.00	33.00	35.00
O.-h. billets, Pittsburgh	33.00	33.00	33.00	35.00
O.-h. sheet bars, P'gh	34.00	34.00	34.00	36.00
Forging billets, P'gh	38.00	38.00	38.00	40.00
O.-h. billets, Phila	38.30	38.30	38.30	40.30
Wire rods, Pittsburgh	40.00	40.00	40.00	45.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.80	1.80	1.80	1.90
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	2.12	2.12	2.12	2.22
Iron bars, Chicago	1.90	1.90	1.90	2.00
Steel bars, Pittsburgh	1.80	1.80	1.80	2.00
Steel bars, Chicago	1.90	1.90	1.90	2.10
Steel bars, New York	2.14	2.14	2.14	2.34
Tank plates, Pittsburgh	1.80	1.80	1.80	1.90
Tank plates, Chicago	1.90	1.90	1.90	2.10
Tank plates, New York	2.12½	2.12½	2.14	2.24
Beams, Pittsburgh	1.80	1.80	1.80	2.00
Beams, Chicago	1.90	1.90	1.90	2.10
Beams, New York	2.09½	2.09½	2.14	2.34
Steel hoops, Pittsburgh	2.20	2.20	2.20	2.50

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Sheets, Nails and Wire,	Jan. 3, 1928	Dec. 27, 1927	Dec. 6, 1927	Jan. 4, 1927
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.80	2.80	2.75	3.00
Sheets, black, No. 24, Chicago dist. mill	2.90	2.90	2.90	3.20
Sheets, galv., No. 24, P'gh	3.65	3.65	3.60	3.85
Sheets, galv., No. 24, Chicago dist. mill	3.70	3.70	3.70	4.05
Sheets, blue, 9 & 10, P'gh	2.10	2.10	2.10	2.30
Sheets, blue, 9 & 10, Chicago dist. mill	2.15	2.15	2.15	2.50
Wire nails, Pittsburgh	2.50	2.50	2.50	2.65
Wire nails, Chicago dist. mill	2.55	2.55	2.55	2.70
Plain wire, Pittsburgh	2.40	2.40	2.40	2.50
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.55
Barbed wire, galv., P'gh	3.20	3.20	3.20	3.35
Barbed wire, galv., Chicago dist. mill	3.25	3.25	3.25	3.40
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.50
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$15.50	$15.00	$14.50	$17.00
Heavy melting steel, Phila.	13.50	13.50	13.50	15.50
Heavy melting steel, Ch'go	12.50	12.25	11.75	13.00
Carwheels, Chicago	13.50	13.50	13.25	15.00
Carwheels, Philadelphia	15.50	15.50	15.50	16.50
No. 1 cast, Pittsburgh	14.50	14.50	14.25	16.00
No. 1 cast, Philadelphia	16.00	16.00	16.00	17.00
No. 1 cast, Ch'go (net ton)	14.00	14.00	14.00	16.50
No. 1 RR. wrot, Phila.	15.25	15.25	15.25	17.00
No. 1 RR. wrot, Ch'go (net)	11.00	10.50	10.25	12.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.75	$2.75	$2.75	$3.75
Foundry coke, prompt	3.75	3.75	3.75	4.50
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	14.25	14.25	14.12½	13.50
Electrolytic copper, refinery	13.75	13.75	13.75	13.00
Zinc, St. Louis	5.65	5.65	5.85	6.97½
Zinc, New York	6.00	6.00	6.20	7.32½
Lead, St. Louis	6.30	6.30	6.37½	7.62½
Lead, New York	6.50	6.50	6.55	7.80
Tin (Straits), New York	57.75	58.25	59.00	67.12½
Antimony (Asiatic), N. Y.	11.00	11.00	11.50	13.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Sheet Mills Have Heavy Unfilled Orders —Scrap Advances—Wages Cut in Connellsville District

PITTSBURGH, Jan. 3.—As the new year opens, price uncertainties mar an otherwise satisfactory steel market. Order books are heavy in practically all finished products, with the exception of pipe, and even in that product some makers are well supplied with line pipe business. There has been a notably heavy accumulation of orders in sheets. Companies reporting to the National Association of Sheet and Tin Plate Manufacturers have approximately 750,000 tons of unfilled orders, the greatest total with one exception—in 1920, when they were close to 800,000 tons—since the compilation of steel statistics. The American Sheet & Tin Plate Co., which represents most of the tonnage outside of the association, also had a heavy December, and the sheet branch of the industry as a whole has orders sufficient to provide a very heavy operation over most of this quarter. Orders on makers' books for tin plate, cold-finished steel bars, strips and hot-rolled bars are in good volume, and since the automobile industry has not yet figured in the orders to the full extent of expectations, much tonnage is expected to come from that source when the motor car builders swing into production schedules.

But there is less satisfaction with prices than with the volume of business. The advance long expected in bars, plates and shapes has failed to materialize, and the explanation is to be found, it is said, in over-anxiety for orders on the part of some mills, which resulted, practically, in the extension of fourth quarter contracts into this quarter. These mills appear to have accepted specifications with a promise to date shipments in keeping with buyers' requirements.

Sheet makers have little business carrying the prices they now are asking. Indeed, acceptance of business at concessions from that level has continued into the past week. Bookings of strip steel have been at low prices, and makers are obligated some distance ahead. Distributers of wire nails are too well supplied or covered to permit makers to do much business at the advances they announced a month ago. It will be another month before makers of cold-finished steel bars get the benefit of higher first quarter prices.

There has been, however, a betterment in the rate of steel plant operations, although they are still about 10 points below the level that manufacturers regard as one permitting appreciable reduction of costs, i.e., between 75 and 85 per cent of capacity.

The scrap market in the past few days has been showing fresh strength. Centers west of Pittsburgh have been feeling the diversion of scrap from Detroit to Buffalo, and the lack of reserves is reflected in a demand from those centers that has given the Detroit market a sharp upswing. Locally, dealers who are short of the market are scurrying to cover in the fear that supplies on which they had relied will go to Ohio. A mill in this district with rather exacting requirements has paid $16 for heavy melting steel, and dealers are paying $15.50 to cover sales made at the latter figure.

The coldest weather of the winter has failed materially to strengthen the fuel situation, the interesting feature of which is the posting by important Connellsville district producers of the November, 1917, scale, which cuts day labor from $6 to $5 per day.

Pig Iron.—Almost all melters of iron are covered on their requirements for this quarter, and current business consists merely of the carload lot purchases of those who rarely anticipate their needs. W. P. Snyder & Co. make the average prices of basic iron shipped from Valley furnaces in December $17 and, of Bessemer, $17.56, as compared with $17 and $17.75 in November.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$17.00
Bessemer	17.50
Gray forge	16.75
No. 2 foundry	17.25
No. 3 foundry	16.75
Malleable	17.50
Low phosphorus, copper free	27.00

Freight rate to the Pittsburgh or Cleveland district, $1.76.

Ferroalloys.—Heavy deliveries against expiring contracts for ferromanganese in the past month have given leading users a good supply for the present, and current demands do not amount to much. There are still some large users who have not made formal contracts for their first half requirements. Shipments of spiegeleisen on contracts also have been heavy in the past month, and specifications for shipment this month are fairly large. Consumers are well covered on their 1928 requirements of ferrosilicon and are specifying well.

Semi-Finished Steel.—All indications point to a good movement of billets, slabs and sheet bars in the next few months, as the sheet, tin plate and strip makers are well supplied with orders and, having bought semi-finished steel rather sparingly in the past four or five months, carried only moderate supplies into the new year. As makers of wire rods have generally covered their customers for this quarter at $40, base Pittsburgh or Cleveland, the new quotation of $42 is likely to apply only on small or pick-up tonnages. Plates are not any too firm at 1.80c., and skelp, which is influenced largely by the plate market, is barely steady at that figure.

Bars, Plates and Shapes.—Mills in this and the Youngstown districts start the new year with a good volume of bar orders, chiefly in specifications on unshipped fourth quarter tonnages, but they are not so well supplied with shape and plate orders. Seemingly, some of the users of plates have concluded that they will be able to do as well on price on new purchases as in ordering out unspecified fourth quarter tonnages. There is accordingly a little more pressure for plate orders than for business in bars and shapes, and prices of plates are beginning to show irregularity. Competition has disclosed willingness on the part of some makers to go $1 a ton below the present market price on first quarter contracts and even lower on definite shipment orders. With railroad car buying on the increase, plates might have been expected to show greater firmness.

Rails and Track Supplies.—Mills are well supplied with rail business, but makers of track accessories still have room for additional orders. Demand for light-section rails still reflects the depression in the soft coal industry, but there has been no weakening in prices.

Wire Products.—Makers are well supplied with orders for nails, but activity is yet to develop in the other products. The general quotation on nails is now $2.55, base, Pittsburgh or Cleveland, and first quarter contracts have been written at that price, with the new card of extras, but it cannot be said to be established, since distributers are too well supplied to be in need of new stocks.

Tubular Goods.—Line pipe is still the backbone of pipe mill operations, as it is a little early for much buying of buttwelded pipe for building and construction work, and demand for lapwelded pipe for oil and gas well drilling awaits the formulation of plans by companies engaged in drilling.

Sheets.—Makers do not lack orders. Indeed, most of them have heavy order books, but they appear to have been built up on low-priced tonnages and the advance named on first quarter contracts, it is feared, will not become effective on any considerable part of the shipments during this quarter. Good demands are coming from the railroad car builders and from the agricultural implement industry, but business from the motor car builders, notably from the Ford Motor Co., is disappointing. Mill operations increased materially with the approach of the end of the year and are now above 80 per cent of capacity. Shipments in the past month, however, ran well under production and sales, which explains the large order books.

Tin Plate.—A material increase in mill operations denotes heavier specifications for contract tonnages of packers' can sizes. The American Sheet & Tin Plate Co. is operating above 70 per cent of capacity, and the Weirton Steel Co., between 70 and 75 per cent. Tin plate prices are very firm. Preferentials to large buyers are smaller than in other years, and there is more insistence on the full quotation to small consumers.

Cold-Finished Steel Bars and Shafting.—Makers are well satisfied with the course of the market, having obtained generous releases against unspecified fourth quarter tonnages and having secured first quarter contracts, carrying an advance of $2 a ton, from almost all buyers who order that way. Prices below 2.20c., base Pittsburgh, on new business disappeared with the end of 1927.

Hot-Rolled Flats.—Makers are well supplied with business but are not satisfied with the prices at which it was taken, particularly on wide strips, which have continued to encounter rather strong competition from plates. On the plate mill gages of strips it is still necessary to match 1.75c., base, for plates to get orders. Makers regard the general market as 2.10c. to 2.20c., base, for very narrow material, 2c. for widths of 2 in. to 6 in. and 1.80c. to 1.90c. for 6 in. and wider.

Cold-Rolled Strips.—The market appears steady at 3c., base (1 up to 3 tons), with a deduction of 25c. per 100 lb. for lots of 3 tons or more of one size, one temper and for shipment at one time. On orders where the requirements are strict and the amount bought is small, makers are still asking and getting 3.15c., base. Some makers have written no first quarter contracts at these prices, feeling that better prices will be obtainable before the quarter ends.

The Iron Age Composite Prices

Finished Steel

Jan. 3, 1928, 2.314c. a Lb.

One week ago	2.314c.
One month ago	2.307c.
One year ago	2.453c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets. These products constitute 86 per cent of the United States output of finished steel.

	High		Low	
1927	2.453c.,	Jan. 4;	2.293c.,	Oct. 25
1926	2.453c.,	Jan. 5;	2.403c.,	May 18
1925	2.560c.,	Jan. 6;	2.396c.,	Aug. 18
1924	2.789c.,	Jan. 15;	2.460c.,	Oct. 14
1923	2.824c.,	Apr. 24;	2.446c.,	Jan. 2

Pig Iron

Jan. 3, 1928, $17.54 a Gross Ton

One week ago	$17.54
One month ago	17.59
One year ago	19.71
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1927	$19.71,	Jan. 4;	$17.54,	Nov. 1
1926	21.54,	Jan. 5;	19.46,	July 13
1925	22.50,	Jan. 13;	18.96,	July 7
1924	22.88,	Feb. 26;	19.21,	Nov. 3
1923	30.86,	Mar. 20;	20.77,	Nov. 20

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel — *Base Per Lb.*

F.o.b. Pittsburgh mills....1.80c.
F.o.b. Chicago....1.90c.
Del'd Philadelphia....2.12c.
Del'd New York....2.14c.
Del'd Cleveland....1.99c.
F.o.b. Cleveland....1.80c.
F.o.b. Buffalo....1.90c.
F.o.b. Birmingham....1.95c. to 2.05c.
C.i.f. Pacific ports....2.35c.
F.o.b. San Francisco mills....2.35c. to 2.40c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills....1.80c. to 1.90c.
F.o.b. Birmingham....2.00c. to 2.10c.

Rail Steel

F.o.b. mills east of Chicago district..1.65c. to 1.70c.
F.o.b. Chicago Heights mill....1.80c.

Iron

Common iron, f.o.b. Chicago....1.90c.
Refined iron, f.o.b. P'gh mills....2.75c.
Common iron, del'd Philadelphia....2.12c.
Common iron, del'd New York....2.14c.

Tank Plates

Base Per Lb.

F.o.b. Pittsburgh mills....1.80c.
F.o.b. Chicago....1.90c.
F.o.b. Birmingham....1.95c. to 2.05c.
Del'd Cleveland....1.99c.
Del'd Philadelphia....2.05c.
F.o.b. Coatesville....1.95c.
F.o.b. Sparrows Point....1.95c.
F.o.b. Buffalo....1.90c.
Del'd New York....2.12½c.
C.i.f. Pacific ports....2.30c.

Structural Shapes

Base Per Lb.

F.o.b. Pittsburgh mills....1.80c.
F.o.b. Chicago....1.90c.
F.o.b. Birmingham....1.95c. to 2.05c.
F.o.b. Buffalo....1.90c.
F.o.b. Bethlehem....1.95c.
Del'd Cleveland....1.99c.
Del'd Philadelphia....2.08c.
Del'd New York....2.09½c.
C.i.f. Pacific ports....2.35c.

Hot-Rolled Flats (Hoops, Bands and Strips)

Base Per Lb.

All gages, 2 in. and narrower, P'gh, 2.10c. to 2.20c.
All gages, wider than 2 in., to 6 in., P'gh, 2.00c. to 2.10c.
*All gages, 6 in. and wider, P'gh..1.80c. to 1.90c.
All gages, narrower than 6 in., Chicago..2.40c.
All gages, 6 in. and wider, Chicago, 2.20c. to 2.40c.

*Mills follow plate or sheet prices according to gage on wider than 14 in.

Cold-Finished Steel

Base Per Lb.

Bars, f.o.b. Pittsburgh mills....2.20c.
Bars, f.o.b. Chicago....2.20c.
Bars, Cleveland....2.25c.
Shafting, ground, f.o.b. mill....*2.35c. to 2.80c.
Strips, under 12 in., 1 up to 3 tons, P'gh, 3.00c. to 3.15c.
Strips, under 12 in., 1 up to 3 tons, Cleveland....3.00c. to 3.15c.
Strips, under 12 in., 1 up to 3 tons, del'd Chicago....3.20c. to 3.45c.
Strips, under 12 in., 1 up to 3 tons, Worcester....3.25c. to 3.40c.

*According to size.

Wire Products

(To jobbers in car lots, f.o.b. Pittsburgh and Cleveland)

Base Per Keg

Wire nails....$2.50 to $2.55
Galvanized nails....4.50 to 4.55
Galvanized staples....3.20 to 3.25
Polished staples....2.95 to 3.00
Cement coated nails....2.50 to 2.55

Base Per 100 Lb.

Bright plain wire, No. 9 gage....$2.40
Annealed fence wire....2.55
Spring wire....3.40
Galv'd wire, No. 9....3.00
Barbed wire, galv'd....$3.20 to 3.25
Barbed wire, painted....2.95 to 3.00

Chicago district mill and delivered Chicago prices are $1 per ton above the foregoing. Birmingham mill prices $3 a ton higher; Worcester, Mass., (wire) mill $3 a ton higher on production of that plant; Duluth, Minn., mill $2 a ton higher; Anderson, Ind., $1 higher.

Woven Wire Fence

Base to Retailers Per Net Ton

F.o.b. Pittsburgh....$65.00
F.o.b. Cleveland....65.00
F.o.b. Anderson, Ind....66.00
F.o.b. Chicago district mills....67.00
F.o.b. Duluth....68.00
F.o.b. Birmingham....68.00

Sheets

Blue Annealed

Base Per Lb.

Nos. 9 and 10, f.o.b. Pittsburgh...2.10c. to 2.15c.
Nos. 9 and 10, f.o.b. Chicago dist. mill, 2.15c. to 2.30c.
Nos. 9 and 10, del'd Cleveland....2.24c. to 2.29c.
Nos. 9 and 10, del'd Philadelphia..2.42c. to 2.47c.
Nos. 9 and 10, f.o.b. Birmingham..2.25c. to 2.30c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh....2.80c. to 2.90c.
No 24, f.o.b. Chicago dist. mill...2.90c. to 3.00c.
No. 24, del'd Cleveland....2.99c. to 3.09c.
No. 24, del'd Philadelphia....3.12c. to 3.22c.
No. 24, f.o.b. Birmingham....3.05c.

Metal Furniture Sheets

No. 24, f.o.b. Pittsburgh, A grade..3.95c. to 4.05c.
No. 24, f.o.b. Pittsburgh, B grade..3.75c. to 3.85c.

Galvanized

No. 24, f.o.b. Pittsburgh....3.65c. to 3.75c.
No. 24, f.o.b. Chicago dist. mill...3.70c. to 3.85c.
No. 24, del'd Cleveland....3.84c.
No. 24, del'd Philadelphia....3.97c. to 4.07c.
No. 24, f.o.b. Birmingham....3.90c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh....2.90c. to 3.00c.
No. 28, f.o.b. Chicago dist. mill...3.00c. to 3.10c.

Automobile Body Sheets

No 20, f.o.b. Pittsburgh....4.00c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill primes...4.10c.

Tin Plate

Per Base Box

Standard cokes, f.o.b. P'gh district mills...$5.25
Standard cokes, f.o.b. Gary and Elwood, Ind. 5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per package, 20 x 28 in.)

8-lb. coating I.C.$11.40 | 25-lb. coating I.C.$17.30
15-lb. coating I.C. 14.45 | 30-lb. coating I.C. 18.75
20-lb. coating I.C. 15.80 | 40-lb. coating I.C. 20.85

Alloy Steel Bars

(F.o.b. Pittsburgh, Chicago or Ohio Mill)

S. A. E. Series Numbers		*Base Per 100 Lb.*
2100*	(1½% Nickel, 0.10% to 0.20% Carbon)	$2.90 to $3.00
2300	(3½% Nickel)	4.00 to 4.10
2500	(5% Nickel)	5.00 to 5.25
3100	(Nickel Chromium)	3.00 to 3.10
3200	(Nickel Chromium)	4.75 to 5.00
3300	(Nickel Chromium)	6.75 to 7.00
3400	(Nickel Chromium)	6.00 to 6.25
5100	(Chromium Steel)	3.00 to 3.10
5200*	(Chromium Steel)	7.00 to 7.50
6100	(Chrom. Vanadium bars)	4.00 to 4.15
6100	(Chrom. Vanad. spring steel)	3.50 to 3.75
9250	(Silicon Manganese spring steel)	3.00 to 3.15
	Carbon Vanadium (0.45% to 0.55% Carbon, 0.15% Vanad.)	4.10 to 4.20
	Nickel Chrome Vanadium (0.60 Nickel, 0.50 Chrom., 0.15 Vanad.)	4.05 to 4.20
	Chromium Molybdenum bars (0.80—1.10 Chrom., 0.25—0.40 Molyb.)	4.00 to 4.25
	Chromium Molybdenum bars (0.50—0.70 Chrom., 0.15—0.25 Molyb.)	3.05 to 3.10
	Chromium Molybdenum spring steel (1—1.25 Chrom., 0.30—0.50 Molybdenum)	4.50 to 4.75

Above prices are for hot-rolled steel bars, forging quality. The ordinary differential for cold-drawn bars is 1c. per lb. higher. For billets 4 x 4 to 10 x 10 in. the price for a gross ton is the net price for bars of the same analysis. For billets under 4 x 4 in. down to and including 2½ in. squares, the price is $5 a gross ton above the 4 x 4 billet price.

*Not S. A. E. specification, but numbered by manufacturers to conform to S. A. E. system.

Rails

Per Gross Ton

Standard, f.o.b. mill....$43.00
Light (from billets), f.o.b. mill....36.00
Light (from rail steel), f.o.b. mill....34.00
Light (from billets), f.o.b. Ch'go mill....36.00

Track Equipment

Base Per 100 Lb.

Spikes, ⅜ in. and larger....$2.80
Spikes, ½ in. and smaller....$2.75 to 2.80
Spikes, boat and barge....3.10
Tie plates, steel....2.25
Angle, bars....2.75
Track bolts, to steam railroads....3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count, 70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ to ⅜	+11	+39
¼ to ⅜	51	25½	½	22	2
½	56	42½	¾	28	11
¾	60	48½	1 to 1¼	30	13
1 to 3	62	50½			

Lap Weld

2	55	43½	2	23	7
2½ to 6	59	47½	2½	26	11
7 and 8	56	43½	3 to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ to ⅜	+19	+54
¼ to ⅜	47	30½	½	21	17
½	53	42½	¾	28	12
¾	58	47½	1 to 1½	30	14
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	15
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

To the large jobbing trade the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5 and 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to large jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two-points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Lap Welded Steel		*Charcoal Iron*	
2 to 2¼ in.	27	1½ in.	+18
2½ to 2¾ in.	37	1¾ to 1⅞ in.	+ 8
3 in.	40	2 to 2¼ in.	— 2
3¼ to 3¾ in.	42½	2½ to 3 in.	— 7
4 to 13 in.	46	3¼ to 4½ in.	— 9

Beyond the above discounts, 7 fives extra are given on lap welded steel tubes and 2 tens to 2 tens and 1 five on charcoal iron tubes.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	60	3 in.	45
1¼ to 1½ in.	52	3½ to 3½ in.	47
1¾ in.	36	4 in.	50
2 to 2¼ in.	31	4½, 5 and 6 in.	45
2½ to 2¾ in.	39		

Hot Rolled

2 and 2¼ in.	37	3¼ and 3½ in.	53
2½ and 2¾ in.	45	4 in.	56
3 in.	51	4½, 5 and 6 in.	51

Less carloads, 4 points less. Add $3 per net ton for more than four gages heavier than standard. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage to be held at mechanical tubes list and discount. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

Per Cent Off List

Carbon, 0.10% to 0.30%, base....55
Carbon, 0.30% to 0.40%, base....50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Old Material.—This market has been growing stronger in the past few days, partly as a result of a purchase of a fair-sized tonnage of heavy melting steel by a mill in this district with rather exacting specifications at $16, but chiefly because of nervousness among dealers over the situation that has lately developed in the Detroit market. Considerable heavy melting steel was sold here in December at $14.50 to $15.50. Because of the threat that scrap which they figured on getting will go elsewhere, dealers are now paying $15.50, and even more, to cover sales made at that price or less. Compressed sheets have been sold at as high as $15. Machine shop turnings are weak, but there is firmness in the blast furnace grades.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Furnace Grades:	
Heavy melting steel	$15.50 to $16.00
Scrap rails	15.00 to 15.50
Compressed sheet steel	14.50 to 15.00
Bundled sheets, sides and ends	13.50 to 14.00
Cast iron carwheels	14.00 to 14.50
Sheet bar crops, ordinary	15.00 to 15.50
Heavy breakable cast	13.00 to 13.50
No. 2 railroad wrought	15.00 to 15.50
Heavy steel axle turnings	13.00 to 13.50
Machine shop turnings	11.00
Acid Open-Hearth Furnace Grades:	
Railroad knuckles and couplers	17.00 to 17.25
Railroad coil and leaf springs	17.00 to 17.25
Rolled steel wheels	16.50 to 17.00
Low phosphorus billet and bloom ends	18.50 to 19.00
Low phosphorus, mill plate	17.50 to 18.00
Low phosphorus, light grade	16.50 to 17.00
Low phosphorus sheet bar crops	17.50 to 18.00
Heavy steel axle turnings	13.00 to 13.50
Electric Furnace Grades:	
Low phosphorus punchings	16.50 to 17.00
Heavy steel axle turnings	13.00 to 13.50
Blast Furnace Grades:	
Short shoveling steel turnings	11.50 to 12.00
Short mixed borings and turnings	11.50 to 12.00
Cast iron borings	11.50 to 12.00
No. 2 busheling	10.00 to 10.50
Rolling Mill Grades:	
Steel car axles	18.00 to 19.00
No. 1 railroad wrought	11.00 to 11.50
Sheet bar crops	17.00 to 17.50
Cupola Grades:	
No. 1 cast	14.50 to 15.00
Rails 3 ft. and under	15.00 to 15.50
Malleable Grades:	
Railroad	15.00 to 15.50
Industrial	14.50 to 15.00
Agricultural	14.00 to 14.50

Fluorspar.—Two good-sized sales of gravel fluorspar to Ohio steel-makers have developed a price of $15 for domestic material, and that price is now the quotable market on the larger tonnages. Some producers did not quote below $16 on the tonnages recently closed and are still naming that price, but it appears to be obtainable only on small tonnages. Steel-makers this winter have not bought so heavily in advance as usual, and consequently competition among producers for what is usually regarded as backlog business is rather sharp.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.60c.
Hoops	4.00c. to 4.50c.
Black sheets (No. 24 gage), 25 or more bundles	3.55c.
Galvanized sheets (No. 24 gage), 25 or more bundles	4.40c.
Blue annealed sheets (No. 10 gage), 25 or more sheets	3.10c.
Galvanized corrugated sheets (No. 28 gage), per square	$4.39
Spikes, large	3.30c. to 3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	62½ per cent off list
Machine bolts, per 100 count	62½ per cent off list
Carriage bolts, per 100 count	62½ per cent off list
Nuts, all styles, per 100 count,	62½ per cent off list
Large rivets, base per 100 lb	$3.50
Wire, black soft annealed, base per 100 lb	2.90
Wire, galvanized soft, base per 100 lb	2.90
Common wire nails, per keg	$2.80 to 2.90
Cement coated nails, per keg	2.85 to 2.95

Bolts, Nuts and Rivets.—Business in bolts and nuts in the past month reached good-sized proportions, firmness in prices having encouraged buyers to specify freely for shipment after Jan. 1. It was the best December several companies here had had in recent years. Revival in railroad car buying has helped demand. Rivets are rather slow, chiefly because so many large users make their own rivets.

Coke and Coal.—Outside of the H. C. Frick Co., which still is paying the scale established Sept. 1, 1922, Connellsville operators generally are back to the November, 1917, scale of wages, or $5 per day for day labor, a cut of $1 per day from what they have lately been paying. This development is not a strengthening factor in coal and coke prices, which remain low and easy also because supplies still exceed demands.

Youngstown

Valley Steel Output Gains—Fear Price War in Automobile Industry

YOUNGSTOWN, Jan. 3.—Steel manufacturers in this district are in the most cheerful mood they have been in for fully six months. Not only was December a good month in orders and specifications, but, for the first time since early in 1927, the trend of steel works and rolling mill operations is definitely upward and the prospect is for further increases in output as motor car builders swing into production on a quantity basis, as they are expected to do in the next 30 days. There is some disappointment that the Ford Motor Co. has not yet brought up the production of its new car to the point of early expectations and that its releases of steel are still light, but that feeling is tempered by a belief that if the orders are not here now they will be later. In general, it is expected that demand for steel from the automotive industry will be greater this year than it was in 1926.

Prosperity in the motor car industry means much to Youngstown steel makers, whose production runs so heavily to the requirements of that industry. The unfavorable feature of the automobile trade is the prospect of a price war among the makers of the lower-priced vehicles. In such an eventuality, it would be merely a case of history repeating itself for the automobile makers involved to seek help from the steel industry in getting the raw materials as cheaply as possible. The kinds of steel going into automobiles, notably sheets and strips, are already moving at such low prices that further recessions would be disastrous.

Good order books have been built up in sheets, strips, wire nails and bars, which, with a fair amount of pipe, business, have contributed to increased plant operations. Based on the number of open-hearth furnaces active, the Youngstown Sheet & Tube Co. is busier than for several months. This company now has 16 of its 24 units here in production. It also is starting up some idle by-product coke oven capacity, evidently to provide additional gas required for the open-hearth furnaces. The Republic Iron & Steel Co. also has a heavier operation, and the Trumbull Steel Co., which recently operated only three of its eight open-hearth furnaces, now has seven active.

The call for pig iron could be much better, as stocks of merchant iron are heavy in both this and the Shenango Valley, estimates placing them at close to 250,000 tons. Not much activity is noted in scrap, but this is explained by the fact that the leading local melters recently acquired a considerable tonnage quietly from regular sources of supply.

Loadings of revenue freight for the week ended Dec. 17, 1927, totaled 868,162 cars, according to reports filed with the car service division of the American Railway Association. This was a decrease of 9438 from the preceding week and a decline of 76,234 compared with the corresponding week of 1926. Total loadings until the above date in 1927 amounted to 50,946,044, compared with 52,338,058 in the corresponding period of 1926 and 50,523,091 in the similar period of 1925.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

F.o.b. Pittsburgh or Youngstown

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and over	$33.00
Rerolling, under 4-in. to and including 1¾ in.	$33.50 to 34.00
Forging, ordinary	38.00 to 39.00
Forging, guaranteed	43.00 to 44.00

Sheet Bars

	Per Gross Ton
Open-hearth or Bessemer	$34.00

Slabs

	Per Gross Ton
8 in. x 2 in. and larger	$33.00
Smaller than 8 in. x 2 in.	34.00

Skelp

	Per Lb.
Grooved	1.80c.
Sheared	1.80c.
Universal	1.80c.

Wire Rods

	Per Gross Ton
*Common soft, base	$40.00 to $42.00
Screw stock	$5.00 per ton over base
Carbon 0.20% to 0.40%	3.00 per ton over base
Carbon 0.41% to 0.55%	5.00 per ton over base
Carbon 0.56% to 0.75%	7.50 per ton over base
Carbon over 0.75%	10.00 per ton over base
Acid	15.00 per ton over base

*Chicago mill base is $42 to $43. Cleveland mill base, $42.

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.55
Old range non-Bessemer, 51.50% iron	4.40
Mesabi Bessemer, 51.50% iron	4.40
Mesabi non-Bessemer, 51.50% iron	4.25
High phosphorus, 51.50% iron	4.15

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algeria	10.00c.
Iron ore, Swedish, average 66% iron,	9.25c. to 9.50c.
Manganese ore, washed, 52% manganese, from the Caucasus	39c.
Manganese ore, Brazilian, African or Indian, basis 50%	38c. to 39c.
Tungsten ore, high grade, per unit, in 60% concentrates	$10.25 to $10.75

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.75
Foundry, f.o.b. Connellsville prompt	$3.75 to 4.50
Foundry, by-product, Ch'go ovens	9.00
Foundry, by-product, New England, del'd	11.50
Foundry, by-product, Newark or Jersey City, delivered	9.45 to 9.85
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis	9.75

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.40 to $1.90
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Mine run gas coal, f.o.b. Pa. mines	1.75 to 1.90
Steam slack, f.o.b. W. Pa. mines	0.80 to 1.00
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.25

Ferromanganese

	Per Gross Ton
Domestic, 80%, furnace or seab'd	$100.00
Foreign, 80%, Atlantic or Gulf port, duty paid	100.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$30.00
Domestic, 16 to 19%	29.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	135.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$23.00	10%	$28.00
7%	24.00	11%	30.00
8%	25.00	12%	32.00
9%	26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal, del'd	92c. to 95c.
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$200.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per net ton	$91.00
Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per net ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silica, gravel, f.o.b. Illinois and Kentucky mines	$15.00 to $15.50
No. 2 lump, Illinois and Kentucky mines	$20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$16.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	$32.50

Fire Clay

	Per 1000 f.o.b. Works	
	First Quality	Second Quality
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	—
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagon	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	6.75c. to 6.50c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled threads up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages	80, 10 and 5
Stove bolts in bulk	80, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discount of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55 to 60 per cent apply.

Large Rivets

(½-In. and Larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$2.75
F.o.b. Chicago	2.85

Small Rivets

(7/16-In. and Smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5 to 70 and 10
F.o.b. Chicago	70, 10, 10 and 5 to 70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 10
Milled standard set screws, case hardened,	80 and 10
Milled headless set screws, cut thread	80
Upset hex. head cap screws, U.S.S. thread,	85 and 5
Upset hex. cap screws, S.A.E. thread	85 and 5
Upset set screws	80, 10 and 10
Milled studs	70 and 5

Chicago

Steel Mill Output Up to 76 Per Cent—Pig Iron Sales Large

CHICAGO, Jan. 3.—An increased rolling rate in rail mills again accounts for an advance in ingot production, steel mill output now being close to 76 per cent of capacity. Shipping schedules already prepared will allow additional expansion in rail production in the first two weeks in January.

Preliminary estimates by local producers indicate that ingot output in this district in 1927 exceeded 1925 by a fair margin but did not equal the tonnage produced in 1926.

Sales in the past seven days compare favorably with any like period in the last 12 months. Mills took the stand that all contracts made at less than 1.90c., Chicago, would be canceled Dec. 31. Judging by new sales made in the closing month of the year it would seem that the market is fairly well stabilized at the new levels.

Industries that have been active in the early winter months remain busy. A substantial tonnage of steel is already assured from railroad car builders, and the indications are that automobile plants and accessory manufacturers will be well engaged by the middle of this month. Specifications for soft steel bars for delivery immediately after the holidays were heavy, representing close to a 50 per cent gain over the corresponding period a year ago.

The Illinois Steel Co. has added a blast furnace at Gary, bringing the total count of active steel mill stacks to 22 out of 36.

Pig Iron.—This commodity is firm at $18.50 a gross ton, f.o.b. local furnaces, and silicon differentials are well maintained, a condition that did not exist in the fall and early winter months. Buying has been in good volume, and producers in this territory enter 1928 with the largest first quarter backlogs in several years. Taking this into account, sellers look for shipments in January to exceed those in December, which was a fair month notwithstanding the time lost by many foundries because of the holidays. The rate of Northern foundry iron production is steady.

Prices per gross ton at Chicago:

Northern No. 2 foundry, sil. 1.75 to 2.25	$18.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	19.00
Malleable, not over 2.25 sil.	18.50
High phosphorus	18.50
Lake Superior charcoal, averaging sil. 1.50	27.04
Southern No. 2 fdy. (all rail)	22.01
Southern No. 2 (barge and rail)	20.18
Low phos., sil. 1 to 2 per cent, copper free	$28.50 to 29.00
Silvery, sil. 8 per cent	29.79
Bessemer ferrosilicon, 14 to 15 per cent	46.79

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—This market is quiet except in ferromanganese, in which some scattered contracting is still taking place. Prices are firm at $100, seaboard. Spiegeleisen is dull, and quotations range from $30 to $32, Hazard, Pa., for the 19 to 21 per cent grade.

Prices delivered Chicago: 80 per cent ferromanganese, $107.56; 50 per cent ferrosilicon, $83.50 to $87.50; spiegeleisen, 18 to 22 per cent, $36.76 to $37.76.

Cast Iron Pipe.—On the whole, this market is moderately active. Business closed with contractors during the week reached 5000 tons, and several public utilities have placed small orders. It is reported that St. Louis may buy 4000 tons of 6, 8 and 10-in. pipe. Prices on going business are steady at $28 to $30, Birmingham, for 6-in. and larger diameters. No complaint is heard from buyers regarding deliveries from foundries.

Prices per net ton, delivered Chicago: Water pipe, 6-in. and over, $36.20 to $38.20; 4-in., $40.20 to $42.20; Class A and gas pipe, $4 extra.

Plates.—Swift & Co., Chicago, have come into the market for 300 steel car underframes. In the recent car buying movement about 15,000 cars have been placed on order, and of that number about 9000 will be constructed in shops that are tributary to Chicago district mills. Buyers who have recently placed orders for plates for the construction of oil storage tanks are issuing heavy specifications and are pressing mills for delivery. This market starts the new year with mill prices well fixed at 1.90c., Chicago.

Mill prices on plates per lb.: 1.90c., base, Chicago.

Structural Material.—Of outstanding interest is the award to the American Bridge Co. of 14,000 tons of steel for the *Daily News* Building, Chicago. Other awards include 600 tons for a brick shed in Chicago and two highway bridges, taking a total of 600 tons, for erection in Iowa. As the new year opens small fabricators finds more tonnage in their shops than in the fall months, but much of this work was taken at the expense of prices. Up to the end of 1927 specifications for stock continued to reach mills from fabricators who wished to take advantage of low-priced contracts which producers threatened to terminate Dec. 31.

Mill prices on plain material per lb.: 1.90c., base, Chicago.

Bars.—Specifications for soft steel bars in December exceeded those of the corresponding month of last year by 50 per cent. To some extent this reflected the desire of buyers to take advantage of contracts entered at low prices that terminated with the close of 1927. Contrary to expectations at this time of the year, consumptive demand is increasing. Shipments are going forward against schedules listed by the automotive trade, and the requirements of manufacturers of farm machinery still represent close to capacity production. Mill prices for mild steel bars are steady at 1.90c., Chicago. The iron bar market is quiet, with prices firm at 1.90c., Chicago. Forward contracting in alloy steel bars continues to drag, but prices are more stable and shipments in December were about 20 per cent heavier than in the final month of 1926. Demand for rail steel bars is of moderate size. One Chicago Heights mill will be down this week for repairs to furnaces. Prices are steady at 1.80c., Chicago district mill.

Mill prices per lb.: Soft steel bars, 1.90c., base, Chicago; common bar iron, 1.90c., base, Chicago; rail steel bars, 1.80c., base, Chicago Heights mill.

Reinforcing Bars.—This market is dull. The pending list is of fair size, but sellers have learned by experience that a project may be held in check for a long time before it develops into an order. The Inland Steel Co. has taken 500 tons of rail steel bars for the Medinah Athletic Club building, Chicago. Prices are steady, but they are not up to the levels that the trade recently sought to establish. Awards and new projects are listed on page 91.

Sheets.—December closed with hot mills engaged at only 60 per cent of capacity. Release orders in the hands of producers, however, assure a sharp upturn in output with the end of the holiday season. Prices remain at the levels of a week ago, and deliveries on all finishes are prompt.

Base prices per lb., delivered from mill in Chicago: No. 24 black, 2.95c. to 3.05c.; No. 24 galvanized, 3.75c. to 3.90c.; No. 10 blue annealed, 2.20c. to 2.35c. Delivered prices at other Western points are equal to the freight from Gary plus the mill prices, which are 5c. per 100 lb. lower than the Chicago delivered prices.

Wire Products.—Users of wire products in the manufacturing trade are forwarding heavier releases. Jobbers are also more active and are now making room for stocks that must be in for the early spring trade. Demand for wire nails has improved, and shipments of barbed wire and staples to the Southwest are measurably heavier. Wire mill operations for the country as a whole average close to 70 per cent, or a gain of more than six points in the week. In the East operations are below the average, while in the South more than 70 per cent of capacity is engaged. Mill prices are steady and are shown on page 97.

Bolts, Nuts and Rivets.—Specifications are more liberal, giving further indication that users' stocks are low and that additional quantities will be needed to meet January requirements. Prices are steady.

Coke.—All ovens in this district are lighted, and shipments at the turn of the year show little change. Prices of by-product foundry coke are steady at $9, local ovens, and $9.50, delivered in the Chicago switching district.

Old Material.—A large user of heavy melting steel has taken 10,000 tons at $12.40 per gross ton, delivered. This tonnage was not of a strictly No. 1 grade and will not have to stand the close inspection given material by some buyers. Bidding for railroad lists brings out higher prices each week, and one just closed is not an exception. Heavy melting steel sold by the Santa Fe brought $11.60 a net ton, on track, which is equivalent to $13.50 a gross ton, delivered. As a general rule, the railroads are getting 25c. to $1 above the most recent sales to consumers. The holiday season has dampened the interest of small buyers, and dealers are concentrating on trading in the heavy tonnage grades.

Prices delivered consumers' yards, Chicago:

Per Gross Ton	
Basic Open-Hearth Grades:	
Heavy melting steel	$12.50 to $13.00
Shoveling steel	12.50 to 13.00
Frogs, switches and guards, cut apart, and miscellaneous rails	13.75 to 14.25
Hydraulic compressed sheets	10.75 to 11.25
Drop forge flashings	9.75 to 10.25
Forged, cast and rolled steel carwheels	15.50 to 16.00
Railroad tires, charging box size	15.50 to 16.00
Railroad leaf springs, cut apart	15.50 to 16.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	14.25 to 14.75
Coil springs	15.75 to 16.25
Low phosphorus punchings	13.50 to 14.00
Electric Furnace Grades:	
Axle turnings	12.50 to 13.00
Blast Furnace Grades:	
Axle turnings	10.50 to 11.00
Cast iron borings	10.25 to 10.75
Short shoveling turnings	10.25 to 10.75
Machine shop turnings	7.75 to 8.25
Rolling Mill Grades:	
Iron rails	13.50 to 14.00
Rerolling rails	14.50 to 15.00
Cupola Grades:	
Steel rails less than 3 ft	15.00 to 15.50
Angle bars, steel	14.25 to 14.75
Cast iron carwheels	13.50 to 14.00
Malleable Grades:	
Railroad	13.00 to 13.50
Agricultural	12.00 to 12.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb	23.00 to 25.00
*Relaying rails, 65 lb. and heavier	26.00 to 31.00
Per Net Ton	
Rolling Mill Grades:	
Iron angle and splice bars	13.50 to 14.00
Iron arch bars and transoms	18.00 to 18.50
Iron car axles	20.50 to 21.00
Steel car axles	15.50 to 16.00
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	11.00 to 11.50
No. 1 busheling	9.50 to 10.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth	12.50 to 13.00
Pipes and flues	8.00 to 8.50
Cupola Grades:	
No. 1 machinery cast	14.00 to 14.50
No. 1 railroad cast	13.00 to 13.50
No. 1 agricultural cast	13.00 to 13.50
Stove plate	11.75 to 12.25
Grate bars	11.50 to 12.00
Brake shoes	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Cold-Rolled Strip.—Little difficulty is being experienced by producers in this district in maintaining the new quantity differentials. In the main, prices are stronger and are working toward 3.15c. per lb., Cleveland, for lots of 1 to 3 tons. Shipments are heavier and for the month of December showed a gain of about 20 per cent over the preceding month.

Rails and Track Supplies.—Two Western railroads have placed 20,000 tons of standard-section rails, and miscellaneous orders for track accessories total 12,000 tons. Inquiry for track supplies is heavy. Rail mill operations have expanded, and rolling schedules point to still heavier output in the next two weeks.

Prices f.o.b. mill, per gross ton: Standard-section open-hearth and Bessemer rails, $43; light rails, rolled from billets, $36. *Per Lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.25c.; angle bars, 2.75c.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforcing bars, billet steel	2.20c. to 2.65c.
Cold-finished steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands	3.65c.
Hoops	4.15c.
Black sheets (No. 24)	3.95c.
Galvanized sheets (No. 24)	4.80c.
Blue annealed sheets (No. 10)	3.50c.
Spikes, standard railroad	3.55c.
Track bolts	4.55c.
Rivets, structural	3.60c.
Rivets, boiler	3.60c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, squares, tapped or blank	60
Hot-pressed nuts, hexagons, tapped or blank	60
No. 8 black annealed wire, per 100 lb	$3.20
Common wire nails, base per keg	$2.90 to 3.00
Cement coated nails, base per keg	2.90 to 3.00

Cincinnati

Pig Iron Business Negligible—Sheet Production Improves

CINCINNATI, Jan. 3.—The usual year-end quiet prevails in the pig iron market. Activities in the past week having been almost at a standstill. Aside from the purchase of 1000 tons of foundry iron by a Louisville melter and 225 tons of foundry and charcoal iron by the Louisville & Nashville Railroad, sales have been negligible. The only important inquiry calls for 300 tons, including 50 tons of Bessemer ferrosilicon, for the local works of the Worthington Pump & Machinery Corporation. The price situation is the same as a week ago, with northern Ohio makers holding to a minimum of $16.50, base furnace, and Ironton Producers asking $19, base Ironton. In the South, furnace interests are quoting $16, base Birmingham.

Prices per gross ton, delivered Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$20.89
So. Ohio malleable	$20.14 to 20.89
Alabama fdy., sil. 1.75 to 2.25	19.69
Alabama fdy., sil. 2.25 to 2.75	20.19
Tennessee fdy., sil. 1.75 to 2.25	19.69
Southern Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Steel.—In spite of the holiday season and the inventory period, the finished steel market has been unusually active. Specifications against contracts for bars, shapes and plates have been fairly liberal. Some consumers with tonnage due on old, low-priced contracts asked that deliveries be carried over into the first quarter, but mills declined to grant this privilege. Sales have consisted of numerous small lots for which buyers are paying 1.80c. per lb., base Pittsburgh, on 100 tons or more, and 1.90c. on single carloads. No improvement in structural steel demand is discernible, and fabricators in this district are entering 1928 with a meager volume of orders on their books. Foldwell & Ahlskog, Chicago, have been awarded the general contract for the Eighth Street viaduct, Cincinnati, which will take about 1300 tons of steel. The tendency toward increased activity in the sheet market has continued. A large producer in this territory reports that operations have reached the highest point since last July, and a further stepping up of production is contemplated. While the failure of the Ford plant to attain a good rate of output has been disappointing, other automobile manufacturers have been buying sheets in moderate quantities. A well-rounded demand for sheets from

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and structural shapes	3.40c.
Bars, soft steel or iron	3.30c.
Reinforcing bars	3.30c.
Hoops	4.00c. to 4.25c.
Bands	3.95c.
Cold-finished rounds and hexagons	3.85c.
Squares	4.35c.
Open-hearth spring steel	4.75c. to 5.00c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue annealed sheets (No. 10)	3.60c.
Structural rivets	3.85c.
Small rivets	65 per cent off list
No. 9 annealed wire, per 100 lb	$3.00
Common wire nails, base per keg	2.95
Cement coated nails, base 100 lb. keg	2.95
Chain, per 100 lb	7.55
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in	$18.00
4-in.	38.00
Seamless steel boiler tubes, 2-in	19.00
4-in.	39.00

consumers in general is one of the most gratifying developments from the standpoint to local district mills. Since most customers are well covered for first quarter at old prices, the recently established quotations of 2.10c., base Pittsburgh, for blue annealed, 3.75c. for galvanized and 2.90c. for black, are as yet scarcely tested, although several producers report small sales at those figures. The nail market is fairly steady at $2.50 per keg, base Ironton.

Reinforcing Bars.—Foldwell & Ahlskog, Chicago, have been awarded the general contract for the Eighth Street viaduct in this city, which will require 3700 tons of bars. Other pending jobs are small, requiring 100 tons or less. Mill prices are firm, with new billet bars quoted at 1.85c., base Pittsburgh, and rail steel bars at 1.75c., base mill.

Warehouse Business.—Shipments out of local warehouses in the past year were about 10 per cent smaller than in 1926. December was a poor month from the standpoint of sales, although several jobbers declare that business was on a par with that in November. Jobbing houses in Cincinnati and Louisville put into effect on Jan. 1 the new card of extras on nails. Prices in general have accumulated strength in the past 10 days.

Coke.—By-product foundry coke during January will remain at $7.50 per net ton, f.o.b. ovens. Domestic grades also are unchanged, with No. 2 nut selling at $4.50, ovens, walnut at $5 and egg at $5.50. At Detroit, by-product domestic egg coke is well established at $6.50, Detroit ovens, for outside shipment and at $7, delivered in Detroit. The Louisville & Nashville is reported to have bought 525 tons of beehive foundry coke for first quarter delivery. Prices of beehive coke from the Wise County and New River districts are firm. Dealers expect an improvement in foundry coke specifications this month.

Foundry coke prices per net ton, delivered Cincinnati: By-product coke, $9.52 to $9.64; Wise County coke, $7.59 to $8.09; New River coke, $10.09 to $10.59. Freight rates: $2.14 from Ashland, Ky.; $2.59 from Wise County and New River ovens.

Old Material.—Although mills show no signs of willingness to pay higher prices, dealers continue to purchase material on the basis of an anticipated buying movement by consumers. Quotations on all items are firm. The Big Four has a list of 4000 tons, including 2000 tons of scrap rails, and the Norfolk & Western has 6000 tons, both of which close this week.

Dealers' buying prices per gross ton f.o.b. cars, Cincinnati:

Heavy melting steel	$11.50 to $12.00
Scrap rails for melting	11.75 to 12.25
Loose sheet clippings	8.75 to 9.25
Bundled sheets	9.50 to 10.00
Cast iron borings	8.50 to 9.00
Machine shop turnings	8.00 to 8.50
No. 1 busheling	10.50 to 11.00
No. 2 busheling	7.50 to 8.00
Rails for rolling	13.00 to 13.50
No. 1 locomotive tires	13.50 to 14.00
No. 1 railroad wrought	11.00 to 11.50
Short rails	17.00 to 17.50
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	16.00 to 17.00
No. 1 railroad cast	13.50 to 14.00
Burnt cast	8.00 to 8.50
Stove plate	9.25 to 9.75
Brake shoes	10.00 to 10.75
Railroad malleable	12.50 to 13.00
Agricultural malleable	12.00 to 12.50

Birmingham

More Inquiry for Pig Iron—Cast Pipe, Coke and Scrap Quiet

BIRMINGHAM, Jan. 3.—Birmingham furnaces enter the new year with an improved outlook. A substantial tonnage is being carried forward and, since Christmas inquiries have been active. The smaller buyers are coming into the market, and sales to this group have been numerous. Sales continue on a $16 base. Furnace operations remain unchanged, 18 stacks being in blast. Nine of these are on foundry, eight are on basic, and one, on recarburizing iron.

Prices per gross ton, f.o.b. Birmingham district furnaces:

No. 2 foundry, 1.75 to 2.25 sil.	$16.00
No. 1 foundry, 2.25 to 2.75 sil.	16.50
Basic	16.00

Finished Steel.—A good volume of business was booked in December, and the outlook for the first quarter is considered favorable. There has been a gradual improvement in the market for the past two months. Mill prices have not been changed within the past several weeks. Neither the Tennessee company nor the Gulf States Steel Co. has made any change in open-hearth furnace operations. The former is running an average of 11 furnaces, and the latter, four.

Cast Iron Pipe.—After the holiday curtailment, plant operations have been resumed at the same rate as previously. A number of inquiries for first quarter tonnage have been received, but bookings last week were small.

Coke.—Demand is improving slightly but the holiday lull still affects the market, which has been quiet for about three weeks.

Old Material.—Business is slow, and the resumption of regular operations in consuming plants, following Christmas, has not yet been reflected in shipments or orders. There have been no price changes recently.

Prices per gross ton, delivered Birmingham district consumers' yards:

Heavy melting steel	$10.00 to $10.50
Scrap steel rails	11.00 to 11.50
Short shoveling turnings	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Stove plate	13.00 to 14.00
Steel axles	19.00 to 20.00
Iron axles	18.00 to 20.00
No. 1 railroad wrought	10.00 to 11.00
Rails for rolling	12.00 to 13.00
No. 1 cast	14.50 to 15.00
Tramcar wheels	12.50 to 13.50
Cast iron carwheels	12.00 to 13.00
Cast iron borings, chemical	13.50 to 14.00

Philadelphia

Fairly Heavy Specifications For Steel As Old Year Ends

PHILADELPHIA, Jan. 3.—Except for the fact that specifications against fourth quarter steel contracts were fairly heavy in the last few days of the old year, the windup of 1927 and the beginning of 1928 have been uneventful in the local iron and steel market. Most of the Eastern mills have good rolling schedules for the next few weeks, but as the tonnage specified will go to buyers at prices lower than are now being quoted it is quite likely that further ordering will be held at a minimum until low-price shipments are completed.

Pig Iron.—The last week of 1927 was one of the quietest of the year in pig iron. Sales by the active furnaces in this district did not exceed a few hundred tons in each case. The Consolidated Machine Tool Corporation, Wilmington, Del., is inquiring for 300 tons of foundry grades for first quarter. Foundry iron remains at $19, base, furnace. Virginia foundry iron is now quoted at $20 to $20.50, furnace.

Prices per gross ton at Philadelphia:

East. Pa. No. 2 plain, 1.75 to 2.25 sil.	$19.76 to $20.26
East. Pa. No. 2X, 2.25 to 2.75 sil.	20.26 to 20.76
East. Pa. No. 1X	20.76 to 21.26
Basic (delivered eastern Pa.)	19.50 to 19.75
Gray forge	19.50 to 20.00
Malleable	21.00 to 21.50
Standard low phos. (f.o.b. New York State furnace)	23.00 to 24.00
Copper bearing low phos. (f.o.b. furnace)	23.50 to 24.00
Virginia No. 2 plain, 1.75 to 2.25 sil.	24.54 to 25.04
Virginia No. 2X, 2.25 to 2.75 sil.	25.04 to 25.54

Prices, except as specified otherwise, are delivered Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Plates, Shapes and Bars.—Consumers and jobbers specified freely against fourth quarter contracts in the last week of the old year. The tonnage which mills put on the books in December ran considerably ahead of that taken in November. Structural steel tonnage probably was larger than that in plates and bars because the new prices on structurals are from $2 to $4 a ton above those which have applied on recent shipments. Very little building work is in prospect at the

moment. Plates are now quoted at 2.05c., shapes at 2.08c., and bars at 2.12c., delivered Philadelphia.

Sheets.—Nearly all of the principal users of sheets have covered for a considerable part of their first quarter requirements at prices which ruled before the recent advances. For some weeks, or perhaps longer, the new prices probably will rule only on small purchases. These prices are: 2.90c. for black, 3.75c. for galvanized and 2.10c. for blue annealed, Pittsburgh base.

Old Material.—The scrap market is stronger only as regards the selling ideas of brokers. No transactions have occurred to advance prices, but some brokers have gone "long" of the market with the expectation that the next important sales will be at higher prices.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$13.50 to $14.00
Scrap T rails	13.00 to 13.50
No. 2 heavy melting steel	11.00 to 11.50
No. 1 railroad wrought	15.25 to 15.75
Bundled sheets (for steel works)	10.50 to 11.00
Machine shop turnings (for steel works)	11.00
Heavy axle turnings (or equivalent)	12.00 to 12.50
Cast borings (for steel works and rolling mill)	11.00 to 11.25
Heavy breakable cast (for steel works)	15.50 to 16.00
Railroad grate bars	12.50
Stove plate (for steel works)	12.50
No. 1 low phos., heavy, 0.04 per cent and under	18.00 to 18.50
Couplers and knuckles	16.00
Rolled steel wheels	15.50 to 16.00
No. 1 blast furnace scrap	10.00 to 10.50
Machine shop turnings (for rolling mill)	11.00 to 11.50
Wrought iron and soft steel pipes and tubes (new specifications)	13.00 to 13.50
Shafting	17.50 to 18.00
Steel axles	19.00 to 20.00
No. 1 forge fire	11.00
Steel rails for rolling	15.00 to 15.50
Cast iron carwheels	15.50
No. 1 cast	16.00 to 16.50
Cast borings (for chemical plant)	15.00 to 15.50

Boston

Pig Iron Sales Recede—New England Foundry Melt at 40 Per Cent Level

BOSTON, Jan. 3.—Pig iron sales in New England dropped off materially during the last week in 1927. The Mystic Iron Works and the Champlain stack again led in bookings, but the combined sales of both furnaces approximated only 1000 tons. The largest individual transaction reported was a sale of 400 tons No. 2X to a Massachusetts foundry at a price equivalent to about $16.50 at Buffalo. A Buffalo stack, which heretofore has quoted as low as $16 base, is now asking $16.50 a ton for No. 2 plain and No. 2X. Other Buffalo furnaces are holding to a $17 base both with and without differentials. There are no open inquiries of any size in the market, and indications are that all of the large melters have enough iron in stock or on order to last through the first quarter. One of the largest has enough iron to last six months. It is conservatively estimated that the New England foundry industry operated at 40 per cent of capacity during December.

Prices of foundry iron per gross ton, delivered to most New England points:

Buffalo, sil. 1.75 to 2.25	$20.91 to $21.91
Buffalo, sil. 2.25 to 2.75	21.41 to 22.41
East. Penn., sil. 1.75 to 2.25	22.65 to 23.15
East. Penn., sil. 2.25 to 2.75	23.15 to 23.65
Virginia, sil. 1.75 to 2.25	25.71
Virginia, sil. 2.25 to 2.75	26.21
Alabama, sil. 1.75 to 2.25	22.91 to 24.77
Alabama, sil. 2.25 to 2.75	23.41 to 25.27

Freight rates: $4.91 from Buffalo, $3.65 from eastern Pennsylvania, $5.21 all rail from Virginia, $6.91 to $8.77 from Alabama.

Cast Iron Pipe.—A contract for a sewage disposal plant for East Providence, R. I., has been let to J. H. Ferguson Co., Providence, which has placed approximately 500 tons of pipe and fittings, required in the project, with the Warren Foundry & Pipe Co. Westfield, Mass., has placed 100 tons of 6-in. pipe with the same foundry. R. D. Wood & Co. were awarded 400 tons 4, 6, 8 and 12-in. Class B pipe for Worcester, Mass., at $41.30 a ton, delivered. The Warren Foundry & Pipe Co. was second low bidder at $41.70. Southern foundries are less active in soliciting business in New England. Boston has yet to place some 2000 tons of pipe and fittings. Through a typographical error, the quotations of B. Nicoll & Co. on this tonnage were reported last week at $29.25 for the 8-in. and 10-in. instead of $39.25 per ton. Most Northern pipe foundries are well booked for the first quarter. Private business continues good at $46.10 to $47.10 a ton, delivered common Boston freight rate point, for 4-in. pipe, and at $41.10 to $42.10 for 6 to 16-in., which compare with $60.10 for 4-in. and $56.10 for 6 to 16-in. a year ago.

Shapes and Plates.—Fabricators report a marked falling off in new prospects. Current bookings are light. The proposed dry goods store and office building in the Park Square district, Boston, calling for 14,000 tons of structural steel, is the largest job of its kind on record in New England. It is believed that few New England plants are equipped to handle this tonnage, and that competition from outside fabricators will be keen. The market for standard shapes and plates is firm at 1.80c. per lb., base Pittsburgh.

Bars.—It now develops that local mill representatives have booked sizable tonnages of bars for first quarter delivery. Most of these orders were taken at prices prevailing before the recent advance, but business was taken at 1.80c. per lb., base Pittsburgh. The market for reinforcing steel bars is much firmer. The commonly quoted out-of-stock price of 2.70c. per lb., base, is steadier than for several months.

Cold-Rolled Strip Steel.—Current bookings are small, and prices remain unchanged.

Mill Prices on Cold-Rolled Strip in North Atlantic States: In 1 to 3-ton lots, 3.25c. per lb., base Pittsburgh, and also, 3.25c. to 3.40c. per lb., base Worcester, Mass.

Coke.—Neither the New England Coal & Coke Co. nor the Providence Gas Co. made any change Jan. 2 in its price on by-product foundry coke. The market remains at $11.50 a ton, delivered within a $3.10 freight rate zone, which compares with $12 a month ago, and $13 a year ago. The New England Coal & Coke Co. is asking $8.50 a ton at ovens for domestic coke, the same price as a month ago. Shipments of foundry fuel in the last week of 1927 were light.

Old Material.—Little old material is offered for sale in New England, as holders of scrap look for higher prices. A small tonnage of No. 1 heavy melting steel was sold during the past week at $9 to $9.50 a ton on cars, shipping point, or $3 a ton under prices of a year ago.

Buying prices per gross ton f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$9.00 to $9.25
Scrap rails	8.75 to 9.00
No. 1 railroad wrought	10.00 to 10.50
No. 1 yard wrought	8.50 to 9.00
Machine shop turnings	6.00 to 6.25
Cast iron borings (steel works and rolling mill)	6.00 to 6.25
Bundled skeleton, long	5.60 to 6.00
Forge flashings	6.00 to 6.50
Blast furnace borings and turnings	6.00 to 6.25
Forge scrap	6.00 to 6.50
Shafting	13.00 to 13.50
Street car axles	16.00 to 17.00
Wrought pipe (1 in. in diameter, over 2 ft. long)	7.50 to 8.00
Rails for rerolling	10.00 to 10.50
Cast iron borings, chemical	9.50 to 10.00

Prices per gross ton delivered consumers' yards:

Textile cast	$14.50 to $15.50
No. 1 machinery cast	14.50 to 15.00
No. 2 machinery cast	12.50 to 13.00
Stove plate	11.00 to 11.50
Railroad malleable	13.50 to 14.00

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and structural shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-finished rounds, shafting and screw stock	3.75c.
Black sheets (No. 24)	4.80c.
Galvanized sheets (No. 24)	5.25c.
Blue annealed sheets (No. 10)	3.60c.
Black corrugated sheets	4.65c.
Galvanized corrugated sheets	5.30c.
Structural rivets	3.60c.
Boiler rivets	3.80c.
	Per Cent Off List
Tank rivets, $\frac{7}{8}$-in. and smaller	70
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, square, blank or tapped	60
Hot-pressed nuts, hexagons, blank or tapped	60

St. Louis

Pig Iron Sales Total 20,000 Tons—Rise in Scrap Continues

ST. LOUIS, Jan. 3.—The Granite City maker reports an unusually large tonnage of pig iron placed during the week—20,000 tons, including 10,000 tons sold to a steel plant in this district. The remainder consisted of orders from malleable plants, radiator manufacturers, specialty makers and jobbing foundries. Melters continue to show keen interest in the market, and the prospects are that considerable business will be placed after the first of the year. Prices are unchanged.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25 f.o.b. Granite City, Ill.	$19.50 to $20.00
Northern No. 2 fdy., delivered St. Louis	20.66
Southern No. 2 fdy., delivered	20.42
Northern malleable, delivered	20.66
Northern basic, delivered	20.66

Freight rates: 81c. from Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Coke.—Cold weather tends to sustain the volume of sales of domestic grades, while buying of foundry coke is rather slow.

Finished Steel.—The usual holiday lull prevails in these lines. Some specifications against contracts were received during the week, but very little new business was placed. The placing of railroad car orders in this district is expected to stimulate steel demand considerably. Warehouse business is quiet. Fabricators of structural steel are booking only a few small orders. The reinforcing bar market is quiet.

Old Material.—Scrap continues to advance. Dealers are paying higher prices and are laying down material in anticipation of a better market after the first of the year. With the placing of some railroad car orders and with others in prospect, dealers believe that consuming plants will buy soon and at higher prices. There was some buying of specialties during the week, and rolling mill grades continue in good demand. Heavy melting steel, heavy shoveling steel, No. 2 railroad wrought and miscellaneous rails are 25c. a ton higher. Machine shop turnings, steel car axles, wrought iron bars and transoms, short rails, No. 1 machinery cast and No. 1 railroad cast have advanced 50c. Unusually high prices were paid for a Missouri Pacific list of 6000 tons, and it is reported that the material was bought by a Kansas City consumer.

Prices per gross ton f.o.b. dealers' yards and delivered St. Louis district consumers' works:

Heavy melting steel	$12.25 to $12.75
No. 1 locomotive tires	14.00 to 14.25
Heavy shoveling steel	12.25 to 12.75
Miscellaneous standard-section rails, including frogs, switches and guards, cut apart	14.25 to 14.75
Railroad springs	15.00 to 15.50
Bundled sheets	9.00 to 9.50
No. 2 railroad wrought	12.25 to 12.75
No. 1 busheling	10.50 to 11.00
Cast iron borings	9.50 to 10.00
Iron rails	13.50 to 14.00
Rails for rolling	15.50 to 16.00
Machine shop turnings	7.50 to 8.00
Steel car axles	20.00 to 20.50
Iron car axles	24.00 to 24.50
Wrought iron bars and transoms	21.00 to 21.50
No. 1 railroad wrought	11.50 to 12.00
Steel rails, less than 3 ft.	16.00 to 16.50
Steel angle bars	13.00 to 13.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.75 to 16.25
Railroad malleable	12.25 to 12.75
No. 1 railroad cast	14.00 to 14.50
Agricultural malleable	11.50 to 12.00
Relaying rails, 60 lb. and under	20.50 to 23.50
Relaying rails, 70 lb. and over	26.50 to 29.00

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and structural shapes	3.15c.
Soft steel bars	3.15c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.80c.
Blue annealed sheets (No. 10)	3.75c.
Galvanized sheets (No. 24)	5.35c.
Structural rivets, ½-in. and larger	5.65c.
Common wire nails, base per keg	$3.35
Cement coated nails, 100-lb. keg	3.35

San Francisco

Prices on Foreign Pig Iron and Coke Reduced

SAN FRANCISCO, Jan. 3.—Little business in iron and steel was transacted during the week, owing to the holidays and the approaching inventory period. Structural shapes and cast iron pipe were the most active products.

A shipment of 550 tons Indian iron arrived on the Coast this week and was divided between Los Angeles and San Francisco. Foreign shipments are increasing, and Indian iron is down $1 a ton, now being quoted at $24 to $25, duty paid.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah foundry, sil. 2.75 to 3.25	25.00 to 26.00
**Indian foundry, sil. 2.75 to 3.25	24.00 to 25.00
**German foundry, sil. 2.75 to 3.25	24.25

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Four thousand tons of English coke is scheduled to arrive in the middle of January, and prices on beehive are now $15 to $16, and on by-product, $12 to $13 per net ton at incoming dock.

Los Angeles placed 771 tons each of cast iron pipe with the American and Pacific States cast iron pipe companies. The Grinnell Co. was low on 350 tons of 20-in. Class B for Pasadena, Cal. Santa Clara, Cal., takes bids Jan. 9 for 1510 tons of 4 to 14-in. Class B.

The Grinnell Co. secured 625 tons of 8-in. seamless pipe for Los Angeles.

Prices remain unchanged except on iron and coke.

Buffalo

Fair Demand for Pig Iron—Leading Steel Plant Curtails Output

BUFFALO, Jan. 3.—The pig iron market remains fairly active. Several lots of 500 to 1000 tons of foundry and malleable have been placed, and new inquiries for like amounts are now before the market. A base price of $17, furnace, is being maintained on business taken in the Buffalo district, but this figure continues to be shaded in New England. It is believed that considerable first quarter contracting is still to be done.

Prices per gross ton, f.o.b. furnace:

No. 2 plain fdy., sil. 1.75 to 2.25	$17.00
No. 2X foundry, sil. 2.25 to 2.75	17.50
No. 1X foundry, sil. 2.75 to 3.25	18.50
Malleable, sil. up to 2.25	17.50
Basic	17.00
Lake Superior charcoal	27.28

Finished Steel.—One of the principal steel producers now has only three open-hearth furnaces active. The other mills continue to maintain their operations, which average about 75 per cent. Inquiry is fair for bars, shapes and plates, and sheet buying has been in good volume. Bids are in for the Hecker-Jones-Jewell Co. flour mill and elevator, Buffalo, which will require 1500 tons of reinforcing bars. Other pending business in concrete bars is limited to small lots.

Old Material.—The market has been lacking in outstanding transactions, and prices remain unchanged. One of the mills continues to restrict shipments, and another, while continuing to accept shipments on old orders, has done no new buying. Reduced open-hearth

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and structural shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.75c.
Cold-finished flats, squares and hexagons	4.45c.
Rounds	3.95c.
Cold rolled strip steel	5.85c.
Black sheets (No. 24)	4.30c.
Galvanized sheets (No. 24)	5.15c.
Blue annealed sheets (No. 10)	3.80c.
Common wire nails, base per keg	$3.65
Black wire, base per 100 lb	3.90

operations in one of the principal steel plants is one of the factors contributing to the general quietness.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$14.50 to $15.00
No. 2 heavy melting steel	13.75 to 14.25
Scrap rails	13.75 to 14.25
Hydraulic compressed sheets	11.50 to 12.00
Hand bundled sheets	8.50 to 9.00
Drop forge flashings	11.50 to 12.00
No. 1 busheling	13.25 to 13.50
Heavy steel axle turnings	12.75 to 13.25
Machine shop turnings	9.00 to 9.25
Acid Open-Hearth Grades	
Railroad knuckles and couplers	15.50 to 15.75
Railroad coil and leaf springs	16.00 to 16.50
Rolled steel wheels	14.75 to 15.25
Low phosphorus billet and bloom ends	15.75 to 16.00
Electric Furnace Grades	
Heavy steel axle turnings	12.75 to 13.25
Short shoveling steel turnings	10.75 to 11.00
Blast Furnace Grades	
Short shoveling steel turnings	10.75 to 11.00
Short mixed borings and turnings	9.75 to 10.00
Cast iron borings	10.00 to 10.50
No. 2 busheling	9.00 to 9.50
Rolling Mill Grades	
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	12.00 to 12.50
Cupola Grades	
No. 1 machinery cast	14.50 to 15.00
Stove plate	12.75 to 13.00
Locomotive grate bars	10.50 to 11.00
Steel rails, 3 ft. and under	16.00 to 16.50
Cast iron carwheels	14.00 to 14.50
Malleable Grades	
Railroad	15.00 to 15.50
Agricultural	15.00 to 15.50
Industrial	15.00 to 15.50

New York

Steel Prices Steady as New Year Opens—Merchant Stack to Go In

NEW YORK, Jan. 3.—Despite the holiday season, the last week of 1927 brought out a fair volume of pig iron buying. Sales by local brokers exceeded 5000 tons, and this total was made up mainly of small lots. In some instances pressure for deliveries indicates that melters have low stocks. Aside from spot demands, it is thought unlikely that there will be extensive buying for this quarter until foundries have completed the taking of inventories. There is only one important first quarter inquiry before the trade. This is from the Worthington Pump & Machinery Corporation, New York, and calls for between 1200 and 1300 tons. Of this amount 350 tons of No. 2 plain and 40 tons of high manganese pig iron are wanted for Holyoke, Mass., 500 to 600 tons of various foundry grades is for Buffalo, and 150 tons of No. 2 plain, 100 tons of No. 1 and 50 tons of Bessemer ferrosilicon are for Elmwood Place, Cincinnati. The No. 2 furnace of Witherbee, Sherman & Co. at Port Henry, N. Y., will be blown in Jan. 4 or 5. The price situation is substantially unchanged.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$21.41 to $21.91
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.89 to 21.52
East. Pa. No. 2 fdy., sil. 2.25 to 2.75	20.39 to 22.02
East. Pa. No. 1X fdy., sil. 2.75 to 3.25	20.89 to 22.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

Finished Steel.—The last week of the old year brought no change in the steel situation beyond the continued accumulation of tonnage specified against expiring fourth quarter contracts. The orders booked by many of the local sales offices were considerably in excess of those received in November, and mills have a larger backlog of orders for the beginning of January than they had at the beginning of December. A number of instances are cited to illustrate the firmness with which the steel companies are holding prices on plates, shapes and bars. While structural shapes on the Bethlehem basis are 2.09½c., delivered New York, efforts to purchase plates and bars along with shapes at the same price are declared to have been fruitless. Contracts have been made with some of the largest buyers at 2.09½c. on shapes, 2.12½c. on plates and 2.14c. on bars, delivered New York. Specifications on fourth quarter sheet contracts were heavier in the last two weeks of December than in the first half of the month, with the result that some consumers and jobbers will be taking deliveries on these specifications throughout January. Hot and cold-rolled strip prices remain unchanged, and other products are steadier than at any time in recent months. All in all, the steel trade enters the new year with the price situation more firmly in hand than at any time during the latter half of 1927.

Mill prices per lb., delivered New York: Soft steel bars, 2.14c.; plates, 2.12½c.; structural shapes, 2.09½c.; bar iron, 2.14c.

Reinforcing Bars.—Awards of 3000 tons of bars for the United States Appraisers' Stores, New York, to the Jones & Laughlin Steel Corporation, and of 800 tons for roadway decks on the second of the Staten Island-New Jersey bridges to E. T. Edwards, Columbia, Pa., were the outstanding transactions in this

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.34c.
Soft steel bars and small shapes	3.24c.
Iron bars	3.24c.
Iron bars, Swedish charcoal	7.00c. to 7.25c.
Cold-finished shafting and screw stock—	
Rounds and hexagons	3.30c.
Flats and squares	3.80c.
Cold-rolled strip, soft and quarter hard,	6.00c. to 6.25c.
Hoops	4.49c.
Bands	3.99c.
Blue annealed sheets (No. 10 gage),	3.84c. to 3.89c.
Long terne sheets (No. 24 gage)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galvanized annealed	5.15c.
Tire steel, 1½ x ½ in. and larger	3.30c.
Smooth finish, 1 to 2½ x ¾ in. and larger	3.65c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

Machine bolts, cut thread:	Per Cent Off List
¾ x 6 in. and smaller	55 to 60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	55 to 60
¾ x 20 in. and smaller	50 to 50 and 10
Coach screws:	
½ x 6 in. and smaller	55 to 60
1 x 16 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded steel, 2-in.	$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt	46	29
¼-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
⅛-in. butt	5	+19
¼-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.90c. to 4.00c.
No. 22	4.05c. to 4.15c.
No. 24	4.10c. to 4.20c.
No. 26	4.20c. to 4.30c.
No. 28*	4.35c. to 4.45c.
No. 30	4.60c. to 4.70c.

Sheets, Galvanized

	Per Lb.
No. 14	4.35c.
No. 16	4.45c.
No. 18	4.50c. to 4.60c.
No. 20	4.65c. to 4.75c.
No. 22	4.70c. to 4.80c.
No. 24	4.85c. to 4.95c.
No. 26	5.10c. to 5.20c.
No. 28*	5.35c. to 5.45c.
No. 30	5.75c. to 5.85c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

market during the last week of the year. These were the last of the outstanding jobs pending, and the new year finds a comparatively small tonnage involved in inquiries. Business has been unusually quiet in the last few days. Distributers have advanced the mill price $1 a ton and are now quoting 1.90c., Pittsburgh. The Youngstown warehouse price is unchanged at 2.20c., or 2.57½c., on cars at New York, and New York warehouses are quoting 2.80c. per lb. for lots of 5 tons or more, delivered at job; 2.95c. for lots of 2 to 5 tons, and 3.24c. for less than 2 tons.

Cast Iron Pipe.—No purchases of consequence were reported in the past week, but with the holidays over a resumption of private buying and some municipal inquiry is expected. There is some export inquiry in the market, including two medium-sized tonnages of water pipe for Cuban projects. The price situation is unchanged, although most makers are fairly well booked and are able to take a more independent position.

Prices per net ton, delivered New York: Water pipe 6-in. and larger, $37.25 to $38.25; 4-in. and 5-in., $42.25 to $43.25; 3-in., $52.25 to $53.25; Class A and gas pipe, $4 to $5 extra.

Fluorspar.—An Ohio consumer during the week purchased 5000 tons of domestic gravel fluorspar for delivery through 1928 and another purchased 500 tons for six months. Prices are weak and unsettled, as is indicated by these sales, which were made at sharp concessions and indicate that the market is not above $15 per ton at mines for good lots, or $1 a ton below recent quotations.

Coke.—Most consumers are fairly well covered for the present, and current purchasing is light. Standard foundry coke is still quoted at $4 per net ton, Connellsville, for prompt shipment, and on a sizable tonnage slightly less might be obtained. Furnace coke ranges from $2.75 to $3, Connellsville. Delivered prices on Connellsville foundry coke are: To northern New Jersey, $8.03; to New York or Brooklyn, $8.79; to Newark or Jersey City, N. J., $7.91. Reports continue that by-product foundry coke prices have been shaded in a few cases, but this cannot be confirmed. Quotations on by-product foundry coke are $9.45 to $9.85 per net ton, delivered Newark or Jersey City.

Warehouse Business.—Despite the holidays, purchasing in the final week of December compared favorably with the rest of the month. Orders were for small tonnages, but total bookings were of fair size.

Old Material.—Although buying prices are substantially unchanged, the market is fairly firm, and in some instances brokers are paying slightly higher prices than a week ago. Stove plate is quoted at $12.25 per ton, delivered Phoenixville, and at $12.50 per ton, delivered Harrisburg, Pa. No. 1 heavy melting steel is unchanged at $13.50 per ton, delivered to consumers at Bethlehem, Conshohocken and Coatesville, Pa., and Claymont, Del. Yard grade is being purchased at $10.50 to $11 per ton, delivered to mills at Phoenixville and Harrisburg. On recent sales of steel axles for shipment to Milton and Columbia, Pa., $21.25 per ton, delivered, is being offered by brokers. Mixed borings and turnings continue unchanged at $10 per ton, delivered to Bethlehem and Swedeland, Pa.

Dealers' buying prices per gross ton, New York:

No. 1 heavy melting steel	$10.00 to $10.85
Heavy melting steel (yard)	6.25 to 7.25
No. 1 heavy breakable cast	11.25 to 12.00
Stove plate (steel works)	8.25 to 8.75
Locomotive grate bars	8.25 to 8.50
Machine shop turnings	6.50 to 7.50
Short shoveling turnings	6.50 to 7.50
Cast borings (blast furnace or steel works)	6.75 to 7.25
Mixed borings and turnings	6.50 to 7.50
Steel car axles	17.00 to 17.50
Iron car axles	23.75 to 24.75
Iron and steel pipe (1 in. diam., not under 2 ft. long)	8.75 to 9.25
Forge fire	6.50 to 7.00
No. 1 railroad wrought	10.50 to 11.00
No. 1 yard wrought, long	9.00 to 9.50
Rails for rolling	10.50 to 11.00
Cast iron carwheels	11.25 to 11.75
Stove plate (foundry)	8.75 to 9.25
Malleable cast (railroad)	10.00 to 10.50
Cast borings (chemical)	11.00 to 12.00

Prices per gross ton, delivered local foundries:

No. 1 machinery cast	$13.50 to $14.00
No. 1 heavy cast (columns, building materials, etc.), cupola size	11.50 to 12.00
No. 2 cast (radiators, cast boilers, etc.)	11.00 to 11.50

Cleveland

Mills Have Good Backlogs—Sustained Demand for Pig Iron

CLEVELAND, Jan. 3.—The new year starts with better operations for some of the mills and prospects for fairly good business through the first quarter. Better operations in the automobile industry are counted on to stimulate the demand for steel. Specifications against expiring contracts for steel bars, plates and structural material were heavy in the past week, and several mills are comfortably filled for a month or longer. Some of the sheet mills have enough orders to keep them running nearly at capacity through January. Mills set Dec. 31 as the deadline for accepting specifications against contracts for steel bars, plates and structural shapes taken at $1 a ton lower than the present market. While there were some cancellations, many consumers ordered about all the steel they had contracted for. Some additional commitments for first quarter were made during the week at the present prices, and most consumers are now under contract.

Mills have received good specifications in the past few days from the automotive industry for sheets and strip steel for January requirements. These indicate an increase in motor car production schedules this month. Very little new business is coming from this source, as most of the automobile companies are well covered with contracts.

In the structural field, inquiry is light and prices on fabricating material are weak. Locomotive orders have stimulated the demand for plates. A Cleveland mill sold 700 tons to a locomotive builder during the week. Steel bars, plates and structural material are firm at 1.80c., Pittsburgh. The ruling Cleveland price on steel bars is 1.80c., mill, although this is being shaded $1 a ton.

Pig Iron.—Sales of foundry and malleable iron have continued quite heavy in the past week, in spite of the holiday season. The greater part of the business came from the automotive industry. Few contracts for delivery beyond the first quarter have been taken, due partly to the fact that producers have not been inclined to sell for the entire first half. However, the size of many of the orders indicate that some foundries are buying enough iron to carry them well into the second quarter. Furnaces are getting a good volume of specifications for January shipment. While the market has a firmer tone than recently, a price of $16.50, furnace, on foundry and malleable iron has not disappeared for shipment to competitive points. At least one Lake producer, however, is now quoting $17, furnace, as its minimum price. In Michigan the market still ranges from $17.50 to $18, furnace. Demand for low phosphorus iron has quieted down after a fair buying movement, and the Valley price has settled down to $26.50, furnace, for most business.

Prices per gross ton at Cleveland:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$18.50
Southern fdy., sil. 1.75 to 2.25	22.00
Malleable	18.50
Ohio silvery, 8 per cent	28.00
Basic, Valley furnace	17.00
Standard low phos., Valley furnace	$26.50 to 27.00

Prices, except on basic and low phosphorus, are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6 from Birmingham.

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and structural shapes	3.00c.
Soft steel bars	3.00c.
Reinforcing steel bars	2.25c. to 2.75c.
Cold-finished rounds and hexagons	3.65c.
Cold-finished flats and squares	4.15c.
Hoops and bands	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.75c.
Galvanized sheets (No. 24)	4.40c. to 4.50c.
Blue annealed sheets (No. 10)	3.25c.
No. 9 annealed wire, per 100 lb	$2.90
No. 9 galvanized wire, per 100 lb	3.35
Common wire nails, base per keg	2.90

*Net base, including boxing and cutting to length.

Semi-Finished Steel.—Last quarter prices will probably prevail through the present quarter on sheet bars, billets and slabs, as specifications have been taken for January shipment at those prices. Following the advance in the Pittsburgh district, a local producer has advanced wire rods to $42, Cleveland. Some first quarter contracts were taken at $40 before the advance.

Sheets.—Mills received good specifications in the past week against orders placed when lower prices were ruling, but little new business came out. The market shows a firmer tone, although prices have not yet got up to the bases adopted by most producers for the first quarter. Black sheets are still available at 2.80c., Pittsburgh. Blue annealed sheets now appear to be holding at a minimum of 2.05c., or a $1 a ton advance, and most mills are holding to 2.10c. On galvanized sheets 3.65c., Pittsburgh, instead of 3.65c., Ohio mill, has become the ruling quotation.

Strip Steel.—Mills have taken considerable business in specifications against hot-rolled strip contracts, but new business is very light. Prices are still weak. Ruling quotations are 1.80c., Pittsburgh, for 6 to 12-in. strip and 2c. for narrower than 6 in. Cold-rolled strip is steady at 2.75c., Cleveland, for 3 tons and over.

Bolts, Nuts and Rivets.—Specifications for bolts and nuts are still light. Orders for rivets from locomotive builders show a slight pick-up. Rivet manufacturers have covered practically all buyers with contracts at $2.75 per 100 lb. for large rivets, and apparently have abandoned the plan of charging those who do not place contracts $5 a ton more.

Reinforcing Bars.—Three new inquiries came out during the week for work aggregating 1300 tons. Rail steel bars are unchanged at 1.65c. to 1.70c., mill.

Old Material.—Efforts of dealers to advance prices have met with success to some extent, as steel-making scrap seems to be no longer available below $13.75 for No. 1 grade. This price represents an advance of 25c. a ton. Dealers are also trying to get a little more money for blast furnace scrap, although locally this material is a drug on the market. Some fair-sized lots of scrap were sold by Detroit automobile manufacturers in the past week, and they are reported to have brought somewhat higher prices than recently prevailed.

Prices per gross ton, delivered consumers' yards:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	$13.75 to $14.00
No. 2 heavy melting steel	13.25 to 13.50
Compressed sheet steel	12.75 to 13.00
Light bundled sheet stampings	11.50 to 11.75
Drop forge flashings	12.50 to 13.00
Machine shop turnings	9.00 to 9.25
No. 1 railroad wrought	11.50 to 12.00
No. 2 railroad wrought	13.50 to 14.00
No. 1 busheling	11.50 to 12.00
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades	
Low phosphorus forging crops	16.50 to 17.00
Low phosphorus, billet, bloom and slab crops	17.00 to 17.50
Low phosphorus sheet bar crops	16.50 to 17.00
Low phosphorus plate scrap	16.00 to 16.50
Blast Furnace Grades	
Cast iron borings	10.25 to 10.75
Mixed borings and short turnings	10.25 to 10.75
No. 2 busheling	10.25 to 10.75
Cupola Grades	
No. 1 cast	16.00 to 16.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	18.00 to 18.50
Miscellaneous	
Railroad malleable	15.00 to 15.50
Rails for rolling	16.25 to 16.50

Three Gear Companies and One Drop Forger to Merge

Plans for the merger of three leading gear manufacturers—the Van Dorn & Dutton Co., Cleveland; the Fawcus Machine Co., Pittsburgh, and the William Ganschow Co., Chicago—and the Ohio Forge Co., Cleveland, maker of drop forgings, are under way. The consummation of the consolidation is expected to be announced this week. A new company, Gears & Forgings, Inc., will acquire the plants and other assets, of the four companies of which the combined resources will exceed $6,000,000. F. W. Sinram, president Van Dorn & Dutton Co., is slated for the presidency of the new company.

Canada

Heavier Contracting for Pig Iron —Scrap Market Softer

TORONTO, ONT., Jan. 3.—Advance buying has been the feature of the Canadian pig iron market during the past few days. Melters are showing more interest in first quarter needs, and contracts now being placed run into large tonnages. However, there are still a large number of Canadian consumers who have not taken action on their first quarter needs. There is nothing in the price situation that leads consumers to look for an early advance.

Old Material.—Some improvement in sales is reported by local dealers, but new business is chiefly in connection with the placing of first quarter contracts, although the large majority of consumers have yet to make known their needs for the next three months. Prices are by no means on a firm footing.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	10.00	10.00
No 1 wrought	9.00	11.00
Machine shop turnings	7.00	6.00
Boiler plate	7.00	7.00
Heavy axle turnings	7.50	7.50
Cast borings	7.50	6.00
Steel turnings	7.00	6.50
Wrought pipe	5.00	6.00
Steel axles	14.00	19.00
Axles, wrought iron	16.00	21.00
No. 1 machinery cast	....	16.00
Stove plate	....	12.00
Standard carwheels	....	14.50
Malleable	....	13.00
	Per Net Ton	
No. 1 machinery cast	15.00	....
Stove plate	9.00	....
Standard carwheels	13.00	....
Malleable scrap	13.00	....

Merger of Youngstown and Inland Companies Being Negotiated

YOUNGSTOWN, Jan. 3.—In an announcement tonight regarding the proposed purchase of the Inland Steel Co., Chicago, by the Youngstown Sheet & Tube Co., President James A. Campbell of the latter company, said:

"We have opened negotiations for a union of the two plants and would be pleased if they could be carried through successfully. There is an economic advantage in putting the two companies together. Their plants lie side by side and could be operated with much less expense if they were under one management. This could be done now, since we are not in competition. It might not be possible later, if we were to enter into different lines of manufacture. We are not buying up Inland stock. We cannot do that and will not."

Weirton Steel Co. Acquires License Under Armco Patents

A statement has been given to the press in the past week to the effect that the Weirton Steel Co., which was one of the two pioneer steel companies in designing and building a modern mill for the production of wide, light sheets by continuous rolling, has taken out a license to use all the patents owned and controlled by the American Rolling Mill Co., for the continuous rolling of steel strips and sheets. The system designed by the Weirton Steel Co. was different in some respects from that in use at the American Rolling Mill Co.'s plant at Ashland, Ky., but it is stated that the taking out of the license by the Weirton company, which is the first steel company to enter into such a contract, is "to obviate patent conflict and to permit orderly development of the new and economical process."

NON-FERROUS METAL MARKETS

The Week's Prices

Cents per Pound for Early Delivery

	Jan. 3	Dec. 30	Dec. 29	Dec. 28
Lake copper, N. Y.	14.25	14.25	14.25	14.25
Electrolytic copper, N. Y.*	13.75	13.75	13.75	13.75
Straits tin, spot, N. Y.	57.75	57.87½	57.87½	57.75
Lead, New York	6.50	6.50	6.50	6.50
Lead, St. Louis	6.30	6.30	6.30	6.30
Zinc, New York	6.00	6.00	6.00	6.00
Zinc, St. Louis	5.65	5.65	5.65	5.65

*Refinery quotation; delivered price ¼c. higher.

NEW YORK, Jan. 3.—All the markets are firm as the year opens. There is, however, very little activity thus far. The copper market is quiet, but decidedly steady. Buying of tin has been moderate at slightly lower levels. Lead is unchanged and firm. The zinc market is getting stronger.

Copper.—As the year opens prices seem to be growing firmer. Nearly all the metal which was available a few days ago at 14c., delivered, is reported to be about all cleaned up and the market is almost entirely on a basis of 14.12½c., delivered in the Connecticut Valley, for electrolytic copper. There is still a little available at the lower price and the market is quoted nominally at 14c. to 14.12½c., delivered. Domestic demand has been and is still very light, which is natural at this season, and there has hardly been buying enough to test the market. There has been a fair amount of business done for export at 13.50c., c.i.f., usual European ports, which continues to be the official quotation of Copper Exporters, Inc. The market as a whole having passed through the holiday season practically without weakening is pointed to as indicative of fundamental strength.

Copper Averages.—The average price of Lake copper for the month of December, based on daily quotations in THE IRON AGE, was 14.20c., delivered. The average price of electrolytic copper was 13.78½c., refinery, or 14.035c., delivered.

Tin.—The holiday week has been a quiet one, as expected. Sales for the last week of the year ended Friday, Dec. 30, were about 700 tons, with 400 tons of this done on Thursday, Dec. 29. On that day consumers were active buyers. Today, the first active business day of the new year, the market has been exceedingly dull, with spot Straits tin quoted at 57.75c., New York. London prices today were a little lower than two weeks ago, with spot standard quoted at £263 10s., future standard at £261 5s., and spot Straits at £263 10s. The Singapore market today was £265 10s. The feature of the market in general is that some consumers are advancing their contracts for February to prompt shipment. They are, however, not buying any more metal, which may mean less demand for prompt and nearby delivery. December deliveries into consumption are reported as 4535 tons, the smallest in a long time. The quantity in stock and landing on Dec. 1 was 1573 tons. Preliminary calculations of the total visible supply indicate an increase of from 642 tons to 1139 tons for December, depending on the calculator. The figures of the London and New York exchanges place the increase at 1139 tons for December, bringing the total to 15,733 tons.

Lead.—The market is quiet and practically unchanged except possibly a little firmer in the West. Demand is light. The quotation of the leading producer is unchanged at 6.50c., New York, as the contract price, with the St. Louis range at 6.30c. to 6.35c.

Zinc.—A fair amount of inquiry is reported for the first business day of the new year. Evidently producers are assuming a firmer attitude as to prices. It is difficult now to purchase any prime Western zinc at less than 5.65c., St. Louis, with some sellers asking a little more.

Nickel.—A reduction in the price of electrolytic nickel is announced by the International Nickel Co. from 39c. to 37c. per lb. in wholesale lots. Quotations for ingot and shot nickel remain unchanged at 35c. and 36c. respectively.

Non-Ferrous Metals at Chicago

CHICAGO, Jan. 3.—A fair amount of forward business is being taken and prices are steady except in tin and antimony. The old metal market is quiet and without feature.

Prices, per lb., in carload lots: Lake copper, 14.25c.; tin, 59c.; lead, 6.40c.; zinc, 5.75c.; in less-than-carload lots, antimony, 12c. On old metals we quote copper wire, crucible shapes and copper clips, 10c.; copper bottoms, 9c.; red brass, 9c.; yellow brass, 6.75c.; lead pipe, 5c.; zinc, 3.50c.; pewter, No. 1, 34c.; tin foil, 43.50c.; block tin, 52c.; aluminum, 12.50c.; all being dealers' prices for less-than-carload lots.

Metals from New York Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	58.50c. to 59.50c.
Tin, bar	60.50c. to 61.50c.
Copper, Lake	15.25c.
Copper, electrolytic	15.00c.
Copper, casting	14.25c.
Zinc, slab	7.75c. to 8.75c.
Lead, American pig	7.65c. to 8.65c.
Lead, bar	9.90c. to 10.90c.
Antimony, Asiatic	13.00c. to 13.50c.
Aluminum No. 1 ingot for remelting (guaranteed over 99 per cent pure)	27.00c. to 28.00c.
Aluminum ingots, No. 12 alloy	26.00c. to 27.00c.
Babbitt metal, commercial grade	30.00c. to 40.00c.
Solder, ½ and ½	39.25c. to 40.25c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig	63.75c.
Tin, bar	64.75c.
Copper, Lake	15.25c.
Copper, electrolytic	15.25c.
Copper, casting	14.50c.
Zinc, slab	7.75c.
Lead, American pig	7.25c.
Antimony, Asiatic	16.00c.
Lead, bar	9.50c.
Babbitt metal, medium grade	19.75c.
Babbitt metal, high grade	67.75c.
Solder, ½ and ½	37.75c.

Non-Ferrous Rolled Products

Mill prices on bronze, brass and copper products are holding at the advances of Dec. 5. There has been no revision in the quotations on zinc sheets and lead full sheets since Aug. 5 and Dec. 1 respectively.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—	
High brass	18.75c.
Copper, hot rolled	22.75c.
Zinc	10.00c.
Lead (full sheets)	10.00c. to 10.25c.
Seamless Tubes—	
High brass	23.62½c.
Copper	24.50c.
Rods—	
High brass	16.50c.
Naval brass	19.25c.
Wire—	
Copper	15.75c.
High brass	19.25c.
Copper in Rolls	21.75c.
Brazed Brass Tubing	26.75c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also allowed to St. Louis on shipments to destinations west of that river.

Sheets, 0 to 10 gage, 3 to 30 in. wide	33.00c.
Tubes, base	42.00c.
Machine rods	34.00c.

Improvement in Steel Business Is Forecast for 1928

(*Concluded from page* 13)

industries declined irregularly throughout the year, notably in the case of railroads, automobile manufacturing, mining and oil-well drilling. The recovery in building and agriculture in the latter part of the year tended to check the decline. One of the strongest features of the steel situation is that production has been fairly well adjusted to the potential requirements of the country, except from April through July, and was relatively low toward the end of the year. This gives reason to believe that stocks of steel are small and that the industry is in a position to respond quickly to the anticipated general business improvement.

The average price of finished steel in 1927 was not so steady as in the preceding year and at the end was about 5 per cent under the average for January (see Fig. 4). There were downward readjustments at the beginning of the year and again in the fall. Clear signs of improvement in prices appeared toward the end of the year, due to curtailed production and a little better sales volume. The notable changes during the year were the generally sagging trend of the markets for bars and nails, and the sharp reductions in sheets during January and February, and again in October and November. These conditions reflected the decline in residential building and in automobile production.

Better Business Anticipated for 1928

THAT a moderate recovery will develop early in the year, and gain considerable momentum before the end of the first half, is the general hypothesis which seems to furnish the most plausible working basis for anticipating the business trend in 1928. There is at present nothing to indicate that business will not be good thereafter, but this cannot be forecast with certainty. The recovery in business will probably lead to a tightening in bank credit and to higher money rates.

It is difficult, if not impossible, to anticipate when these developments will occur. If business recovery brings an increase in commercial loans by spring, and gold exports continue during the next two or three months, money rates may be expected to advance and bring a recession in security markets before the end of the first quarter. This, however, need not be followed by a slump in business any more than it was in February, 1926.

Commodity prices are not likely to show a sharp advance nor a large decline. On the one hand, the practical completion of deflation in foreign currencies, and curtailed domestic production together with higher farm prices, will make for firmness. But, on the other hand, gold exports and the probable curtailment of bank credit, together with a large productive capacity and active competition at home and abroad, will tend to depress prices. Little more than a guess seems possible, but such a guess would be that commodity prices will advance somewhat in the early part of 1928, then recede a little, and then show irregular recovery. It does not seem that business will have to contend with a steadily declining price level, as was the case during 1926 and a good part of 1927. (See Fig. 5.)

Improvement in Steel Seems Certain

AS to the steel industry, recovery seems practically certain during the first half of the year and possibly thereafter. The expansion in the automobile industry, which is in sight, together with sustained activity in building and a general improvement in business, seem to make this as nearly certain as such things can be. Moreover, it is a reasonable probability that the oil industry has seen its worst days and will show improvement during 1928.

In the same way, railroad equipment buying will almost certainly be better next year than it has been during most of 1927. At present the rather large surplus of freight cars and locomotives held by the carriers and a low percentage of bad-order equipment seem to make any early sustained buying movement improbable. But the longer the period which elapses without replacements, the more necessary will the buying be when railroad freight traffic begins to reflect the probable expansion in general business.

I will only add that both my P-V line and the unfilled steel orders barometer, which are regular features of this department of THE IRON AGE, agree in forecasting early improvement for general business and for the iron and steel industry.

Many Factors Participated in Development of Continuous Sheet

(*Concluded from page* 77)

are (a) better constructed motors and (b) finer pieces of mechanism. both in the drives and in the mills themselves. The multiple roll backed-up mill requires machinery of a quality not at all comparable with the old-fashioned mills. In turn a higher grade of skilled mechanic is required to take care of it. He has had to throw his sledge hammer away and replace it with a micrometer and a set of feelers. The machinery manufacturers should receive much credit for their assistance in this development.

Studies in Finishing Departments

Just how far the development will carry is hard to predict, but it seems well within the bounds of possibility that the rolling of tin plate and the processing of both tin plate and high finished sheets will be affected profoundly. Concurrently with the development of the rolling mills themselves, the processing, pickling, annealing and cold rolling processes have been the subject of study, analysis and invention. As in the rolling mills, continuous operation of a sequence of processes is the achievement to be desired, simultaneously effecting an equally great reduction of labor and improvement in quality, due to scientific control.

Most of the inventions and discoveries necessary for the successful operation of the new method have been covered by patents, possibly to a greater extent than any single section of the steel industry save perhaps that of wire making. The rolling process and machinery and the subsequent processing, annealing and pickling, all come within the scope of this patent protection. It would be unfortunate if the situation were handled in any but the fairest manner, for which the leaders of the American steel industry are eminently fitted.

Schedule of the next installments of the ***Business Analysis and Forecast****, by Dr. Lewis H. Haney, Director New York University Bureau of Business Research, follows:* ***Jan. 12****—Activity in Steel Consuming Industries;* ***Jan. 19****—Position of Iron and Steel Producers;* ***Jan. 26****—General Business Outlook.*

Steel Trade Now Looks to 1928 to Compensate for 1927

(*Concluded from page 5*)

lands, 29,756 tons; and Sweden, 19,728 tons. This leaves 25,309 tons supplied from all other sources.

Machinery exports in the first 11 months are reported at $397,335,175. This is a gain of practically $30,000,000 over the corresponding period of 1926. If December shows up as well as November did, the total will be about $433,000,000 for the year. This is the largest export volume in a number of years. Agricultural implements made a large gain in 1926 and a further one in 1927, the total for 11 months having been $83,849,667. Heavy gains were made also in oil-well machinery, road-making machinery, machine tools, textile machinery, sugar mill machinery, refrigerating and ice machinery, air compressors, and type-setting machines. There were notable declines in automobile engines, electric locomotives, mining and quarrying machinery, and some of the smaller lines.

UNITED STATES EXPORTS OF IRON AND STEEL
(Gross Tons)

	1922	1923	1924	1925	1926	1927
Jan.	160,920	123,190	247,942	141,777	174,585	215,235
Feb.	133,975	133,902	164,820	102,299	157,187	166,129
Mar.	208,843	163,920	123,618	155,384	169,438	171,094
Apr.	198,830	177,471	131,276	155,375	194,449	192,339
May	230,062	203,389	154,136	150,612	173,418	202,708
June	212,295	171,183	163,770	136,847	159,506	184,364
July	157,169	168,558	137,481	139,861	194,717	190,502
Aug.	145,640	161,426	134,628	188,465	171,588	175,636
Sept.	129,475	172,499	135,979	136,791	182,071	166,352
Oct.	132,924	152,511	157,071	141,817	172,070	170,255
Nov.	127,782	186,956	123,577	171,134	219,830	177,928
Dec.	150,170	177,844	128,865	142,209	198,189	.....
	1,988,085	1,992,849	1,803,163	1,762,571	2,167,048	2,190,000*

*Estimated, as to December.

1927 Earnings Declined Sharply

Low prices and lessened production were reflected in the earnings of the leading steel companies. The contrast with 1926 was most marked in the third quarter when the United States Steel Corporation reported earnings representing a decline of $11,250,000, or more than 20 per cent, from the third quarter of 1926. Assuming that the corporation's fourth quarter profits will show a further decline, it is probable that the full year's net income will be 15 per cent under 1926. In the last three years the Steel Corporation's quarterly earnings were as follows:

Quarter	1927	1926	1925
First	$45,584,725	$45,061,285	$39,882,992
Second	46,040,460	47,814,105	40,624,220
Third	41,373,831	52,626,826	42,400,419
Fourth	.....	53,503,525	42,630,840

At the annual meeting in April last year the Steel Corporation's common issue was increased by a stock dividend of 40 per cent or 2,033,210 shares and the dividend rate of $7 a year has since been maintained on the enlarged issue. This increased the quarterly dividend charge by $3,518,117. As a result only $17,775,683 was added to the surplus in the first three-quarters of 1927, as compared with $39,832,768 in the first nine months of 1926. Earnings per share of common stock in the past year were at the rate of $2.81 in the first quarter, $2.78 in the second and $2.15 in the third.

Profits of the Bethlehem Steel Corporation also showed a decline from 1926, amounting to $5,618,038, $5,048,680 and $2,788,053 respectively in the first, second and third quarters of 1927, as compared with $5,865,850, $5,348,023 and $4,550,978 in the corresponding three quarters of 1926. The $13,454,771 earned thus far in 1927, however, is almost equal to the profits for all four quarters of 1925, which amounted to $13,858,196. In the early part of the year there was some public reference to the possibility of the company beginning dividend payments on its common stock, but earnings in the third quarter at the rate of only 61c. a share on the common stock made such action a matter of the future.

The Jones & Laughlin Steel Corporation reported net profits of $9,841,816 in the first three quarters of 1927, of which $3,658,724 was earned in the first quarter, $3,576,079, in the second, and $2,607,013, in the third. This compares with $3,843,045 in the first quarter of 1926, $3,658,724 in the second and $4,257,787 in the third quarter of that year, a total of $11,759,556. The 1927 earnings represent a decrease of 16 per cent.

Net profits of the Youngstown Sheet & Tube Co., amounting to $5,857,070 in the first three quarters of 1927, were less than half of the $11,994,092 earned in the first nine months of 1926. Each quarter showed a falling off in view of the lessened demand for the company's chief products, sheets and pipe, particularly the latter, also the year's lower prices.

Republic Iron & Steel Co. earnings fell off rather sharply, particularly in the September quarter, when they were $501,992, against $1,312,266 in the third quarter of 1926. Net profits amounted to $2,534,528 in the first nine months of 1927, or about $1,250,000 less than in the corresponding period of 1926, and a little more than equaling the profits of the first three quarters of 1925.

Inland Steel Co., with net profits of $5,590,041 in the first three quarters of the year, bettered its 1926 showing for the like period by more than $500,000 and was the only one of the larger companies to show an increase. The company had considerably better earnings in both the first and second quarters of 1927 than 1926, but profits in the third quarter amounted to $1,244,021, as compared with $1,701,286 in the September quarter of 1926.

American Rolling Mill Co. Announces Refinancing Program

Announcement of a refinancing program has been made by the American Rolling Mill Co., which has sold a $25,000,000 bond issue of 20-year 5 per cent sinking fund gold debenture notes to W. E. Hutton & Co. and Harris, Forbes & Co. It is the intention of the company to call on April 1 the outstanding 7 per cent cumulative preferred stock, amounting to $11,625,300, and by July 1, the outstanding 15-year notes, totaling $6,650,000. Furthermore, from the proceeds of the bond issue will be retired the preferred stock and bonds issued in connection with the purchase last July of the Columbia Steel Co. In addition, each common stockholder of record as of Jan. 10, 1928, will be given the right to subscribe to one share at $75 for each six shares then held. Since there were approximately 926,000 common shares outstanding at the time of the company's last annual statement and one stock dividend of 5 per cent has been paid in the interim, the new subscription rights will call for the issuance of more than 162,000 new common shares at $75 a share. The money derived from the sale of common stock on this basis will be used to take care of the company's heretofore announced plans for improvements and extensions at its various plants, which will materially increase its production capacity.

Through the completion of this program, approved by the board of directors on Dec. 30, the capital structure of the American Rolling Mill Co. will be so simplified that only the common stock and the new bond issue of $25,000,000 will be outstanding. A public offering of the bond issue is expected some time in January.

Iron and Steel Prices for Sixteen Years

Monthly Averages Computed from the Weekly Market Quotations of THE IRON AGE in the Period of 1912 to 1927

IN this issue of THE IRON AGE are our two colored price charts, in which plotted lines indicate the course of prices for pig iron, billets, scrap and leading forms of finished iron and steel and non-ferrous metals in the 16 years ended with 1927. The diagrams are based on monthly averages of prices quoted week by week in our market reports from the leading selling centers. In the tables following are the monthly average prices of more than 80 products, including those on which the charts are based.

Bessemer Pig Iron at Pittsburgh, per Gross Ton (2240 lb.)

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$15.05	$18.15	$14.96	$14.59	$21.58	$35.95	$37.25	$33.60	$40.00	$33.96	$21.56	$29.27	$24.76	$24.64	$22.76	$21.26
February	14.90	18.15	15.09	14.55	21.51	35.95	37.25	33.60	42.90	31.46	21.46	29.83	25.26	24.51	22.76	20.76
March	15.09	18.15	15.09	14.55	21.75	37.70	37.25	32.54	43.40	28.16	21.46	32.02	25.14	24.06	22.76	21.16
April	15.15	17.90	14.90	14.55	21.95	42.20	36.15	29.35	43.60	26.96	22.59	32.77	24.56	22.89	21.39	21.26
May	15.13	17.70	14.90	14.59	21.95	45.15	36.15	29.35	44.03	26.16	26.36	31.87	23.89	21.76	21.14	20.96
June	15.15	17.14	14.90	14.70	21.95	54.70	36.38	29.35	44.80	24.71	26.96	30.27	22.89	20.76	20.76	20.64
July	15.20	16.70	14.90	14.95	21.95	57.45	36.60	29.35	47.15	22.84	26.77	28.46	21.96	20.76	20.39	20.26
August	15.46	16.52	14.90	15.95	21.95	54.75	36.60	29.35	49.11	21.96	29.96	28.26	21.76	20.76	19.76	20.16
September	16.15	16.65	14.90	16.85	22.26	48.03	36.60	29.35	50.46	21.96	35.27	28.26	21.76	21.06	20.01	19.76
October	17.80	16.60	14.84	16.95	24.08	37.25	36.60	29.35	49.16	21.96	35.17	26.96	21.76	21.39	20.89	19.76
November	18.02	16.02	14.59	17.51	30.15	37.25	36.60	31.26	41.10	21.96	33.52	25.26	22.13	22.64	21.66	19.76
December	18.15	15.77	14.70	19.65	35.68	37.25	36.60	36.65	36.96	21.96	29.90	24.64	23.66	22.76	21.64	19.39
Average	*15.94*	*17.12*	*14.89*	*15.78*	*23.90*	*43.64*	*36.67*	*31.09*	*44.39*	*25.34*	*27.58*	*28.68*	*23.29*	*22.33*	*21.33*	*20.46*

Basic Pig Iron, f.o.b. Mahoning or Shenango Valley Furnace, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$12.35	$16.41	$12.50	$12.50	$17.81	$30.00	$33.00	$30.00	$37.40	$30.00	$18.15	$25.80	$21.25	$22.00	$20.00	$18.00
February	12.25	16.30	13.19	12.50	17.69	30.00	33.00	30.00	42.25	27.50	17.75	26.25	22.00	22.00	20.00	18.00
March	12.81	16.11	13.00	12.50	18.20	32.25	33.00	28.94	41.50	24.20	17.94	30.13	21.94	21.30	20.00	18.40
April	13.00	15.87	13.00	12.50	18.13	38.75	32.00	25.75	42.40	22.88	20.00	31.05	21.55	20.13	18.63	19.00
May	13.00	15.15	13.00	12.50	18.00	41.60	32.00	25.75	43.25	22.00	24.60	29.00	20.50	18.81	18.38	18.20
June	13.12	14.50	13.00	12.59	18.00	48.75	32.00	25.75	44.00	20.75	25.00	27.38	19.63	18.05	18.00	17.88
July	13.40	14.37	13.00	12.74	18.00	52.50	32.00	25.75	45.85	19.38	24.25	25.10	19.00	18.00	17.63	17.50
August	13.94	14.06	13.00	14.06	18.00	51.20	32.00	25.75	48.10	18.20	26.60	24.75	19.00	18.00	17.50	17.30
September	14.37	14.00	13.00	14.75	18.31	42.75	32.00	25.75	48.50	19.13	32.63	24.88	19.00	18.30	17.50	17.06
October	15.98	13.90	12.81	15.00	19.88	33.00	33.00	25.75	43.75	19.19	30.90	23.50	19.00	18.63	18.00	17.00
November	16.37	13.09	12.48	15.75	25.10	33.00	33.00	28.31	36.50	19.00	27.75	20.88	19.13	19.88	18.50	17.00
December	16.50	12.71	12.50	17.50	30.00	33.00	33.00	34.25	33.00	18.63	24.81	21.00	20.90	20.00	18.50	17.00
Average	*13.92*	*14.71*	*12.87*	*13.74*	*19.76*	*38.90*	*32.50*	*27.65*	*42.21*	*21.74*	*24.20*	*25.81*	*20.24*	*19.59*	*18.55*	*17.70*

Local No. 2 Foundry Pig Iron at Chicago (at Furnace), per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$14.00	$17.90	$13.75	$13.00	$18.50	$30.00	$33.00	$31.00	$40.00	$31.50	$18.90	$28.90	$23.70	$24.00	$23.00	$20.38
February	14.00	17.31	14.00	13.00	18.50	32.00	33.00	31.00	42.25	29.00	19.00	29.75	24.50	24.00	23.00	20.25
March	14.00	17.25	14.25	12.95	18.70	36.00	33.00	29.94	43.00	25.60	20.00	31.25	24.38	23.80	23.00	20.00
April	14.00	17.00	14.25	13.00	19.00	39.25	33.00	26.75	43.00	24.00	20.50	32.00	24.10	22.50	22.00	20.00
May	14.50	16.00	14.06	13.00	19.00	43.80	33.00	26.75	43.00	22.80	22.60	32.00	22.75	21.13	21.63	20.00
June	14.50	15.62	13.69	13.00	19.00	51.00	33.00	26.75	43.40	20.75	23.25	31.25	21.25	20.30	21.10	20.00
July	14.70	14.70	13.75	13.00	19.00	55.00	33.00	26.75	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00
August	15.37	15.00	13.69	13.44	18.40	55.00	33.00	26.75	46.00	19.55	28.60	27.00	20.38	20.50	21.00	19.50
September	16.00	15.00	13.25	13.90	18.13	54.67	33.00	26.75	46.00	21.75	32.00	26.75	20.50	21.00	21.00	19.50
October	17.00	15.00	12.94	14.63	19.63	33.00	34.00	27.75	44.50	21.00	31.40	25.00	20.50	21.63	21.00	19.00
November	17.75	14.87	12.56	17.13	25.80	33.00	34.00	31.00	39.40	20.60	29.75	23.13	21.00	22.75	21.00	18.50
December	18.00	14.30	13.00	18.10	29.50	33.00	34.00	38.75	34.50	19.63	28.00	23.00	22.50	23.00	21.00	18.50
Average	*15.32*	*15.83*	*13.60*	*14.01*	*20.26*	*41.31*	*33.25*	*29.16*	*42.53*	*22.93*	*24.85*	*28.16*	*22.10*	*22.09*	*21.64*	*19.68*

Standard Brands Eastern Pennsylvania No. 2X Foundry Pig Iron at Philadelphia, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$14.85	$18.25	$14.65	$14.25	$19.94	$30.10	$34.25	$36.15	$44.10	$33.34	$21.34	$29.76	$24.11	$25.01	$24.26	$22.76
February	14.85	18.25	14.94	14.25	20.00	31.88	34.25	36.15	45.10	31.09	21.09	30.01	24.04	25.01	24.14	22.26
March	14.92	17.77	15.00	14.25	20.05	37.31	34.25	34.39	45.53	27.59	21.26	32.30	24.16	24.21	23.36	22.26
April	15.00	17.40	15.00	14.25	20.50	41.38	34.25	31.90	46.85	26.26	23.62	32.95	23.06	22.82	23.26	22.26
May	15.18	16.75	14.81	14.25	20.50	43.60	34.25	30.70	47.10	25.71	26.09	32.76	22.67	21.51	22.89	22.26
June	15.31	16.19	14.75	14.25	19.94	48.19	34.29	29.50	47.15	25.50	27.06	30.76	21.85	21.26	22.66	22.14
July	15.70	15.60	14.75	14.31	19.75	53.13	34.40	29.08	48.15	23.55	27.92	27.68	21.26	21.26	22.26	21.51
August	15.87	15.60	14.75	14.94	19.55	53.00	34.40	29.60	51.96	20.64	32.26	25.89	21.51	21.57	22.26	21.26
September	16.59	15.83	14.75	16.00	19.50	51.67	34.40	30.70	53.51	21.22	34.83	26.26	21.76	21.96	22.26	20.76
October	17.60	15.95	14.63	16.25	20.31	34.25	38.85	32.10	52.53	22.23	32.54	24.04	21.76	22.64	22.26	20.51
November	18.25	15.56	14.50	17.12	24.90	34.25	39.15	35.35	44.99	22.74	30.39	23.01	22.64	23.64	23.56	20.26
December	18.25	15.20	14.25	19.05	29.25	34.25	39.15	40.10	35.54	21.82	28.86	24.26	24.56	24.26	23.39	20.26
Average	*16.03*	*16.53*	*14.73*	*15.26*	*21.18*	*41.08*	*35.49*	*32.98*	*46.88*	*25.14*	*27.27*	*28.31*	*22.78*	*22.93*	*23.05*	*21.55*

Southern No. 2 Foundry Pig Iron at Cincinnati, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.25	$16.95	$13.88	$12.40	$17.90	$26.10	$35.90	$34.60	$41.80	$36.75	$20.70	$27.45	$25.55	$24.05	$25.69	$22.19
February	13.31	16.69	13.81	12.40	17.90	27.53	35.90	34.60	43.60	32.63	20.00	28.68	26.55	24.05	25.69	21.69
March	13.50	16.31	14.00	12.27	17.90	31.90	35.90	33.54	43.60	29.80	19.50	30.80	26.55	24.05	25.69	21.69
April	13.75	15.65	13.75	12.34	17.90	37.40	35.90	30.65	44.00	28.00	20.38	31.05	26.35	24.05	25.69	21.69
May	14.15	14.94	13.75	12.40	17.90	41.90	35.90	29.85	45.60	26.70	22.10	30.75	25.55	24.05	25.69	21.69
June	14.25	14.06	13.63	12.50	17.34	45.15	36.08	28.39	45.60	26.38	23.00	29.30	24.05	23.25	24.59	21.69
July	14.70	13.75	13.30	12.71	16.90	49.90	36.60	28.35	45.60	24.75	22.30	28.85	22.05	22.18	24.19	21.13
August	15.06	14.06	13.25	13.71	16.70	49.90	36.60	30.40	45.78	23.50	24.35	27.68	21.55	22.55	24.19	20.94
September	15.87	14.25	13.25	14.15	17.28	49.90	36.60	31.25	46.50	23.50	29.55	26.55	21.55	22.85	24.07	20.94
October	16.80	14.35	12.90	14.78	18.03	49.38	37.60	31.60	46.50	23.50	30.85	24.68	21.55	23.43	23.69	20.94
November	17.25	13.87	12.90	16.15	22.40	35.90	37.60	34.35	42.50	22.90	27.55	23.65	21.80	24.87	23.69	19.69
December	17.25	13.95	12.50	17.10	25.90	35.90	37.60	38.60	42.50	21.75	26.93	25.05	23.85	25.49	23.69	19.69
Average	*14.93*	*14.90*	*13.41*	*13.58*	*18.67*	*40.07*	*36.52*	*32.16*	*44.47*	*26.68*	*23.93*	*27.87*	*23.91*	*23.74*	*24.71*	*21.16*

Mahoning and Shenango Valley No. 2 Foundry Iron, at Furnace, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.00	$17.50	$12.85	$13.00	$18.50	$31.00	$33.00	$31.00	$39.40	$31.88	$19.30	$27.00	$22.50	$22.38	$20.50	$18.50
February	13.00	17.00	13.19	13.00	18.31	32.00	33.00	31.00	41.50	28.00	18.88	27.50	23.00	22.00	20.50	18.50
March	13.12	16.69	13.25	13.00	18.50	34.75	33.00	29.94	41.25	25.90	19.00	30.50	23.00	21.10	20.50	18.50
April	13.25	15.55	13.25	12.75	18.50	39.75	33.00	26.75	42.80	24.75	20.75	31.00	21.80	20.13	19.00	18.50
May	13.25	14.62	13.00	12.94	18.20	42.40	33.00	26.75	44.25	23.50	23.80	30.20	20.75	19.13	18.88	18.50
June	13.25	14.06	13.00	12.69	18.13	50.25	33.00	26.75	45.00	22.10	24.00	27.63	19.63	18.30	17.96	18.13
July	13.37	13.87	13.00	12.70	18.25	54.50	33.00	26.75	45.00	20.13	24.25	25.50	19.00	18.50	17.69	18.00
August	13.69	14.00	13.00	13.62	18.25	53.20	33.00	26.75	47.00	19.63	32.60	24.88	19.13	18.50	17.50	17.60
September	14.44	14.00	13.00	14.70	18.39	47.00	33.00	26.75	49.40	21.00	34.88	24.75	19.80	18.80	17.63	17.50
October	16.10	13.84	12.90	14.87	20.00	33.00	34.00	26.75	46.50	21.00	31.80	23.60	19.50	19.13	18.50	17.50
November	16.94	13.50	12.75	15.50	25.00	33.00	34.00	31.50	40.25	20.75	27.88	21.88	19.50	20.39	19.00	17.45
December	17.25	13.50	12.75	18.30	30.75	33.00	34.00	36.75	36.20	20.00	25.63	22.00	21.20	20.50	18.80	17.25
Average	*14.22*	*14.84*	*13.00*	*13.92*	*20.07*	*40.32*	*33.25*	*28.95*	*43.21*	*23.22*	*25.23*	*26.37*	*20.73*	*19.90*	*18.87*	*18.00*

Gray Forge Pig Iron, Philadelphia and Vicinity, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$14.25	$17.65	$14.00	$13.50	$18.44	$28.38	$32.00	$33.90	$40.23	$32.78	$20.60	$27.85	$22.81	$24.00	$23.00	$21.50
February	14.25	17.31	14.00	13.44	19.00	29.75	32.00	33.90	40.50	30.90	20.50	28.37	22.50	23.63	23.00	21.19
March	14.25	16.87	14.00	13.25	19.00	31.94	32.00	32.84	43.00	26.86	20.50	29.62	22.12	23.40	22.30	21.00
April	14.37	16.56	14.00	13.25	19.13	38.50	32.00	29.65	43.00	25.26	21.25	30.37	22.00	22.63	22.00	21.00
May	14.50	15.81	13.81	13.25	19.50	40.40	32.00	29.21	43.00	25.26	23.80	29.50	22.00	21.50	22.00	21.00
June	14.62	15.37	13.75	13.25	19.25	44.31	32.00	26.25	43.00	24.69	24.25	28.00	22.00	21.50	21.90	21.00
July	14.87	14.95	13.75	13.25	18.50	50.05	32.00	25.92	43.00	22.50	25.50	26.90	21.20	21.50	21.50	21.00
August	15.37	14.62	13.75	14.50	18.50	49.56	32.00	26.60	45.46	21.20	29.00	25.50	21.00	21.00	21.40	20.60
September	15.87	14.56	13.75	15.13	18.50	44.25	32.00	27.00	47.10	20.00	31.00	25.50	21.00	21.00	21.00	20.50
October	16.87	15.00	13.62	15.25	19.35	32.20	36.60	28.69	47.10	20.50	31.00	24.20	21.00	21.25	21.00	20.25
November	17.62	14.75	13.50	16.05	23.75	32.00	36.60	32.40	44.64	22.50	29.14	23.00	21.37	22.00	22.50	19.50
December	17.75	14.58	13.50	17.63	27.69	32.00	36.90	36.10	38.74	21.69	28.14	23.00	23.10	23.00	22.50	19.50
Average	*15.38*	*15.67*	*13.79*	*14.31*	*20.05*	*37.78*	*33.18*	*30.21*	*43.23*	*24.51*	*25.39*	*26.82*	*21.84*	*22.20*	*22.01*	*20.67*

Malleable Pig Iron at Chicago, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$14.35	$17.90	$13.88	$13.00	$19.00	$30.94	$33.50	$31.50	$40.50	$32.00	$18.90	$28.90	$23.88	$24.00	$23.00	$20.88
February	14.14	17.31	13.94	13.00	19.00	31.75	33.50	31.50	42.75	29.38	19.13	29.75	24.50	24.00	23.00	20.25
March	14.00	17.25	14.25	13.00	19.40	35.40	33.50	30.44	43.50	25.80	20.00	31.25	24.38	24.00	23.00	20.00
April	14.00	17.05	14.25	13.00	19.50	39.00	33.50	27.25	43.50	24.00	20.50	32.00	24.10	22.63	22.00	20.00
May	14.40	16.00	14.06	13.00	19.50	43.60	33.50	27.25	43.50	23.00	22.60	32.00	22.75	21.25	21.42	20.00
June	14.50	15.62	13.88	13.00	19.50	50.25	33.50	27.25	43.50	21.50	23.25	31.25	21.25	20.60	21.10	20.00
July	14.50	14.65	14.00	13.00	19.50	55.00	33.50	27.25	45.25	19.00	24.25	27.90	19.60	20.50	21.00	20.00
August	15.10	15.00	14.00	13.44	19.00	55.00	33.50	27.25	46.50	19.60	28.60	27.00	20.38	20.50	21.00	19.50
September	16.25	15.00	13.25	14.30	19.00	54.75	33.50	27.25	46.50	21.75	32.00	26.75	20.50	21.00	21.00	19.50
October	17.10	15.20	13.00	15.25	19.88	33.50	34.50	28.25	45.75	21.00	31.40	25.00	20.50	21.63	21.00	19.00
November	17.87	14.87	12.88	17.13	25.80	33.50	34.50	31.50	39.90	20.60	29.75	22.13	20.88	22.75	21.00	18.50
December	18.00	14.63	12.90	18.20	29.50	33.50	34.50	39.50	35.00	19.63	28.00	23.00	22.62	23.00	21.00	18.50
Average	*15.35*	*15.87*	*13.69*	*14.11*	*20.72*	*41.35*	*33.75*	*29.68*	*43.01*	*23.11*	*24.87*	*28.16*	*22.11*	*22.15*	*21.63*	*19.68*

Lake Superior Charcoal Pig Iron at Chicago, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$16.00	$18.15	$15.25	$15.75	$19.50	$31.75	$37.50	$38.85	$48.75	$42.50	$31.10	$33.15	$29.15	$29.04	$29.04	$27.04
February	15.95	18.00	15.25	15.75	19.75	33.75	37.50	38.85	58.38	39.50	29.38	33.90	29.15	29.04	29.04	27.04
March	15.75	18.00	15.25	15.75	19.75	36.75	37.50	38.85	58.20	38.50	26.00	35.40	29.15	29.04	29.04	27.04
April	15.75	18.00	15.45	15.75	19.75	40.25	37.50	31.75	57.25	38.50	26.50	36.53	29.15	29.04	29.04	27.04
May	15.75	18.00	15.75	15.75	19.75	48.15	37.50	31.75	57.50	37.50	28.40	36.65	29.15	29.04	29.04	27.04
June	16.75	16.81	15.75	15.75	19.75	52.88	37.62	31.75	57.50	37.50	29.75	36.65	29.12	29.04	29.04	27.04
July	16.25	15.65	15.75	15.75	19.75	57.75	38.00	31.75	57.50	36.37	31.65	34.81	29.04	29.04	29.04	27.04
August	16.25	14.69	15.75	16.00	19.75	58.00	38.00	32.25	57.70	33.60	34.05	32.04	29.04	29.04	29.04	27.04
September	17.12	15.25	15.75	15.85	19.75	58.00	38.00	32.75	58.50	33.00	36.15	32.04	29.04	29.04	29.04	27.04
October	18.65	15.25	15.75	15.75	20.25	37.50	38.00	33.44	58.50	31.50	36.15	29.86	29.04	29.04	27.54	27.04
November	18.65	15.25	15.75	17.00	26.46	37.50	38.70	38.50	55.75	31.50	36.15	28.40	29.04	29.04	27.04	27.04
December	18.75	15.25	15.75	18.65	31.75	37.50	38.70	43.00	49.13	31.50	34.65	29.15	29.04	29.04	27.04	27.04
Average	*16.80*	*16.53*	*15.60*	*16.13*	*21.33*	*44.15*	*37.88*	*35.29*	*56.22*	*35.96*	*31.66*	*33.22*	*29.09*	*29.04*	*28.58*	*27.04*

No. 2 Foundry Pig Iron at Buffalo, (at Furnace) per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.50	$17.43	$12.85	$12.89	$18.75	$34.94	$33.00	$31.00	$40.90	$32.38	$19.44	$26.94	$22.25	$23.00	$21.00	$18.00
February	13.50	17.06	12.94	13.00	18.53	35.25	33.00	31.00	42.00	30.50	18.87	27.56	22.25	22.75	21.00	17.39
March	13.63	16.70	13.22	12.41	18.72	38.45	33.00	29.94	44.75	29.00	18.30	29.05	21.81	22.12	21.00	17.00
April	13.56	16.22	13.50	12.80	18.88	42.62	33.00	26.75	45.00	26.15	20.81	29.56	21.37	20.65	21.00	17.50
May	13.50	15.18	13.41	12.88	18.78	44.95	33.00	26.75	45.00	25.62	22.62	29.40	20.25	19.00	20.75	17.50
June	13.88	14.32	13.13	12.87	18.65	48.31	33.00	26.75	44.75	23.42	23.05	29.06	19.37	19.00	19.60	17.39
July	14.03	13.83	13.05	12.70	18.70	52.25	33.00	26.63	45.00	20.87	24.50	26.00	19.00	18.85	19.00	16.88
August	14.50	13.98	13.25	13.85	18.63	53.00	33.00	27.77	47.75	19.50	30.70	24.95	19.19	18.72	19.00	16.10
September	15.50	14.09	13.22	14.90	19.00	53.00	33.00	28.25	50.10	20.00	33.94	24.87	19.37	18.75	19.00	16.13
October	16.62	14.00	12.72	15.63	20.37	33.00	34.00	28.70	47.44	20.37	31.12	23.06	19.05	19.40	19.00	16.88
November	17.25	13.69	12.44	16.28	27.25	33.00	34.00	34.30	42.56	19.12	27.80	20.87	20.50	21.19	19.00	17.00
December	17.56	12.87	12.95	18.13	32.75	33.00	34.00	38.25	36.60	19.30	25.50	21.56	22.62	21.50	19.00	17.00
Average	*14.75*	*14.95*	*13.06*	*14.03*	*20.75*	*41.81*	*33.25*	*29.67*	*44.32*	*23.85*	*24.72*	*26.07*	*20.59*	*20.41*	*19.86*	*17.06*

No. 2 Foundry Pig Iron at Cleveland, (Delivered Consumer) per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.25	$17.87	$13.50	$13.44	$19.30	$31.10	$33.30	$31.40	$40.00	$33.40	$20.06	$27.87	$23.70	$23.87	$22.32	$19.50
February	13.25	17.53	13.82	13.50	19.23	32.93	33.30	31.40	41.90	30.22	20.06	29.00	24.50	23.99	22.38	19.13
March	13.25	17.16	14.25	13.47	19.05	37.06	33.30	30.58	43.15	27.80	21.55	32.15	24.50	23.47	21.81	19.90
April	13.25	16.39	14.25	13.38	19.36	40.27	33.30	27.15	43.40	26.62	20.81	32.52	24.25	22.82	20.85	19.87
May	13.30	15.62	14.38	13.38	19.45	42.90	33.30	27.15	44.53	25.50	23.75	32.21	23.25	20.87	20.00	19.50
June	13.56	14.96	14.25	13.28	19.07	50.63	33.32	27.15	44.90	24.00	24.06	30.46	21.50	20.12	19.69	19.20
July	13.81	14.69	13.75	13.20	18.79	55.80	33.40	27.15	45.20	21.31	24.75	27.44	20.25	20.00	19.50	19.00
August	14.19	14.68	13.75	14.32	18.76	55.17	33.40	27.40	48.06	20.50	31.31	26.40	20.56	20.00	19.50	19.00
September	15.45	14.75	13.75	15.27	18.92	53.15	33.40	27.65	49.86	20.75	35.94	25.87	20.81	20.00	19.50	19.00
October	16.85	14.83	13.73	15.43	20.12	33.30	34.40	28.15	47.88	20.75	34.09	25.25	21.00	20.55	19.87	18.88
November	17.59	14.40	13.51	16.61	26.20	33.30	34.40	31.90	43.46	20.56	30.47	23.35	21.31	22.32	20.60	18.50
December	17.87	13.78	13.27	18.18	31.13	33.30	34.40	36.90	36.32	19.95	27.25	23.06	22.39	22.26	20.39	18.50
Average	*14.64*	*15.56*	*13.85*	*14.46*	*20.78*	*41.58*	*33.60*	*29.67*	*44.06*	*24.28*	*26.18*	*27.97*	*22.34*	*21.69*	*20.53*	*19.17*

Southern No. 2 Foundry Pig Iron at Birmingham, Dollars per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$10.00	$13.56	$10.63	$9.50	$15.00	$23.20	$33.00	$31.00	$38.75	$32.25	$16.20	$23.25	$21.50	$20.00	$22.00	$18.50
February	10.06	13.38	10.56	9.50	15.00	24.63	33.00	31.00	40.00	28.13	15.00	24.38	22.50	20.00	22.00	18.00
March	10.25	13.06	10.70	9.35	15.00	29.00	33.00	29.44	40.00	25.30	15.00	26.40	22.50	20.00	22.00	18.00
April	10.55	12.40	10.50	9.44	15.00	34.50	33.00	26.75	40.50	23.50	15.88	27.00	22.30	20.00	22.00	18.00
May	10.94	11.69	10.50	9.44	15.00	39.00	33.00	26.75	42.00	22.20	17.60	26.85	21.50	20.00	22.00	18.00
June	11.00	10.81	10.35	9.65	14.50	42.25	33.00	25.25	42.00	21.88	18.38	25.75	20.00	19.60	21.20	18.00
July	11.45	10.50	10.00	9.75	14.00	47.00	33.00	25.15	42.00	20.25	18.25	25.00	18.00	18.00	21.00	17.44
August	11.81	10.81	10.00	10.75	13.80	47.00	33.00	27.38	42.00	19.00	20.10	23.70	17.50	18.00	21.00	17.25
September	12.75	11.00	10.00	11.50	14.38	47.00	33.00	27.95	42.00	19.00	26.00	22.75	17.50	18.50	20.75	17.25
October	13.50	11.25	10.00	12.13	15.50	33.00	34.00	28.00	42.00	19.00	26.80	20.63	17.50	19.38	20.00	17.25
November	14.00	10.63	10.00	13.40	20.13	33.00	34.00	30.75	38.00	18.40	23.50	19.60	17.75	21.00	20.00	16.00
December	14.00	10.70	9.60	14.38	23.00	33.00	33.40	35.20	38.00	17.33	22.88	21.00	19.80	22.00	20.00	16.00
Average	*11.69*	*11.65*	*10.24*	*10.73*	*15.86*	*36.05*	*33.20*	*28.72*	*40.60*	*22.19*	*19.63*	*23.86*	*19.86*	*19.71*	*21.16*	*17.47*

Bessemer Pig Iron, per Gross Ton, at Valley Furnace

	1922	1923	1924	1925	1926	1927
January	$19.60	$27.50	$23.00	$22.88	$21.00	$19.50
February	19.50	28.06	23.50	22.75	21.00	19.00
March	19.50	30.25	23.38	22.30	21.00	19.40
April	20.63	31.00	22.80	21.13	19.63	19.50
May	24.40	30.10	22.13	20.00	19.38	19.20
June	25.00	28.50	21.13	19.00	19.00	18.88
July	25.00	26.70	20.20	19.00	18.63	18.50
August	28.20	26.50	20.00	19.00	18.00	18.40
September	33.50	26.50	20.00	19.30	18.25	18.00
October	33.40	25.20	20.00	19.63	19.13	18.00
November	31.75	23.25	20.38	20.88	19.90	18.00
December	28.13	22.88	21.90	21.00	19.88	17.56
Average	*25.63*	*27.20*	*21.53*	*20.57*	*19.57*	*18.66*

Basic Pig Iron, per Gross Ton, Delivered Eastern Pennsylvania

	1922	1923	1924	1925	1926	1927
January	$20.18	$27.80	$23.00	$24.25	$23.00	$21.50
February	19.84	28.19	22.69	23.88	23.00	21.19
March	22.61	29.56	21.81	23.55	22.10	20.85
April	21.00	30.81	21.50	22.31	21.75	20.75
May	24.00	30.60	21.00	21.13	21.75	20.75
June	25.00	28.14	21.00	21.50	21.45	20.75
July	25.75	26.60	20.20	21.50	21.00	20.75
August	27.23	25.00	20.00	20.50	20.95	20.15
September	30.83	25.00	20.00	20.70	20.75	20.00
October	29.30	24.20	20.00	21.25	20.69	20.00
November	27.83	22.88	21.13	22.39	22.60	19.60
December	27.31	23.13	23.41	23.00	22.00	19.25
Average	*25.08*	*26.83*	*21.31*	*22.16*	*21.75*	*20.46*

Malleable Pig Iron, per Gross Ton, f.o.b. Valley Furnace

	1921	1922	1923	1924	1925	1926	1927
January	$32.00	$19.50	$27.00	$22.39	$22.39	$20.50	$18.50
February	28.75	19.00	27.63	23.00	22.00	20.50	18.50
March	25.80	19.00	30.50	22.50	21.50	20.50	18.50
April	25.00	19.50	31.00	22.10	20.63	19.00	18.50
May	24.10	24.20	30.20	21.00	19.25	18.88	18.50
June	22.75	24.50	28.13	19.88	18.50	18.05	18.13
July	20.88	25.13	25.40	19.00	18.50	17.75	18.00
August	20.00	29.50	24.50	19.13	18.50	17.50	17.60
September	20.13	33.50	24.50	19.80	18.80	17.63	17.50
October	20.50	32.70	23.30	19.50	19.13	18.50	17.50
November	20.20	29.00	20.88	19.75	20.38	19.00	17.50
December	20.00	26.25	20.00	21.20	20.50	18.75	17.50
Average	*23.34*	*25.15*	*26.09*	*20.77*	*20.01*	*18.88*	*18.02*

Virginia No. 2X Foundry Pig Iron, Delivered Eastern Pennsylvania (Per Gross Ton)

	1921	1922	1923	1924	1925	1926	1927
January	$40.49	$27.84	$32.97	$30.17	$29.67	$28.17	$27.67
February	37.24	27.61	33.17	30.52	29.67	28.17	26.67
March	34.59	27.24	33.79	30.67	29.67	28.17	26.67
April	32.99	27.74	34.67	30.67	29.67	28.17	27.17
May	32.99	28.24	35.07	30.67	29.17	28.17	27.17
June	32.99	28.24	33.17	30.67	29.17	28.17	27.17
July	31.86	30.17	32.27	29.37	29.17	28.17	27.17
August	29.94	30.17	31.42	28.67	29.17	28.17	26.67
September	28.49	36.17	30.92	28.67	28.77	28.17	25.98
October	28.24	38.17	30.17	28.67	28.17	28.17	25.79
November	28.24	37.17	30.17	28.67	28.17	28.17	25.79
December	28.24	33.92	30.17	29.27	28.17	28.17	25.79
Average	*32.19*	*31.06*	*32.33*	*29.77*	*29.05*	*28.17*	*26.64*

Gray Forge Pig Iron, per Gross Ton, f.o.b. Valley Furnace

	1921	1922	1923	1924	1925	1926	1927
January	$30.88	$19.00	$26.50	$22.00	$21.88	$20.00	$18.00
February	27.00	18.81	27.00	22.00	21.50	20.00	18.00
March	24.70	18.75	30.00	22.00	20.60	20.00	18.00
April	23.75	20.44	30.50	21.40	19.63	18.50	18.00
May	22.40	23.30	29.70	20.25	18.63	18.38	18.00
June	20.88	23.50	26.63	19.13	17.80	17.45	17.63
July	19.13	23.75	25.00	18.50	18.00	17.20	17.50
August	18.90	29.45	24.00	18.63	18.00	17.00	17.10
September	20.00	34.13	24.00	19.30	18.30	17.13	17.00
October	20.00	31.10	23.30	19.00	18.63	18.00	17.00
November	19.70	27.63	21.39	19.00	19.88	18.50	16.95
December	19.25	25.25	21.50	20.70	20.00	18.25	16.75
Average	*22.21*	*24.59*	*25.79*	*20.16*	*19.39*	*18.39*	*17.33*

Standard Low-Phosphorus Pig Iron at Furnace in New York State (Per Gross Ton)

	1921	1922	1923	1924	1925	1926	1927
January	$42.63	$30.00	$35.00	$27.10	$25.50	$23.25	$24.50
February	41.50	30.00	35.00	27.00	25.50	23.00	25.00
March	41.50	30.00	35.00	27.00	25.10	22.50	25.00
April	38.75	30.00	35.00	25.80	24.75	22.38	25.00
May	38.00	30.00	33.20	24.75	24.00	22.00	25.00
June	38.00	30.00	30.50	24.75	23.00	22.00	25.00
July	38.00	30.00	29.00	24.00	22.00	22.00	25.00
August	36.80	33.00	29.00	24.00	22.00	22.00	25.00
September	36.50	38.00	28.50	24.00	22.00	22.00	23.00
October	36.50	38.00	28.00	23.75	22.00	22.88	23.00
November	36.50	38.00	27.88	23.88	24.00	24.10	23.00
December	34.87	35.00	27.50	25.30	24.00	24.00	23.00
Average	*38.25*	*32.67*	*31.13*	*25.11*	*23.65*	*22.68*	*24.29*

THE IRON AGE Composite Iron and Steel Prices

Composite Pig Iron Price

Average of THE IRON AGE quotations on basic pig iron at Valley furnace and foundry iron at Chicago, Birmingham, Buffalo, Valley and Philadelphia. Quoted in dollars a gross ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$12.65	$16.49	$12.76	$12.38	$17.81	$28.88	$33.21	$31.36	$39.08	$31.13	$18.48	$26.78	$22.15	$22.44	$21.79	$19.44
February	12.61	16.31	13.18	12.38	17.76	29.75	33.21	31.36	42.35	28.45	18.14	27.20	22.84	22.50	21.77	19.07
March	12.93	16.07	13.16	12.34	18.06	32.18	33.21	30.10	42.17	25.13	18.35	30.11	22.81	21.99	21.65	19.03
April	13.09	15.74	13.13	12.37	18.15	38.56	32.71	27.11	42.93	23.73	20.00	30.83	22.31	20.95	20.96	19.21
May	13.27	14.98	13.06	12.37	18.08	41.87	32.71	26.91	43.64	22.78	23.35	29.74	21.40	19.85	20.69	19.09
June	13.36	14.35	12.97	12.45	17.91	47.95	32.71	26.46	44.09	21.73	23.95	28.23	20.27	19.22	20.00	18.92
July	13.68	13.99	12.92	12.55	17.79	52.11	32.73	26.37	45.44	20.22	23.86	25.96	19.31	18.96	19.51	18.56
August	14.15	13.93	12.91	13.55	17.63	51.43	32.73	26.83	47.38	18.97	26.69	25.19	19.40	19.01	19.46	18.17
September	14.74	13.97	12.83	14.28	17.82	46.95	32.73	27.11	47.83	19.89	31.78	25.02	19.46	19.39	19.46	18.03
October	16.01	13.93	12.67	14.67	19.18	33.21	34.31	27.52	45.05	19.97	30.57	23.30	19.46	19.92	19.69	17.96
November	16.52	13.39	12.42	15.82	24.36	33.21	34.36	30.34	38.65	19.79	27.82	21.40	19.79	21.16	20.13	17.59
December	16.63	13.06	12.39	17.34	28.63	33.21	34.26	36.13	34.51	19.11	25.70	21.88	21.60	21.54	19.94	17.55
Average	*14.14*	*14.68*	*12.87*	*13.54*	*19.43*	*36.11*	*33.24*	*28.97*	*42.76*	*22.58*	*24.06*	*26.30*	*20.90*	*20.58*	*20.42*	*18.55*

Composite Price of Finished Steel

Average of THE IRON AGE quotations on steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets. Quoted in cents a pound

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	1.424	1.771	1.451	1.383	2.06	3.384	3.549	3.371	3.158	3.057	2.059	2.469	2.783	2.560	2.447	2.432
February	1.40	1.766	1.477	1.395	2.203	3.501	3.549	3.371	3.486	2.918	2.007	2.605	2.782	2.546	2.428	2.378
March	1.394	1.786	1.473	1.413	2.447	3.739	3.549	3.282	3.743	2.764	2.014	2.721	2.746	2.537	2.433	2.367
April	1.433	1.79	1.446	1.437	2.611	4.110	3.549	3.031	3.842	2.737	2.075	2.814	2.692	2.503	2.439	2.360
May	1.456	1.727	1.424	1.433	2.75	4.562	3.549	3.021	3.804	2.764	2.113	2.793	2.639	2.460	2.416	2.360
June	1.47	1.687	1.399	1.444	2.689	5.004	3.549	3.021	3.756	2.643	2.148	2.789	2.610	2.440	2.420	2.369
July	1.504	1.667	1.40	1.471	2.64	5.334	3.549	3.021	3.885	2.455	2.169	2.783	2.563	2.435	2.431	2.367
August	1.553	1.624	1.446	1.511	2.682	5.249	3.549	3.021	3.967	2.341	2.292	2.775	2.515	2.413	2.431	2.367
September	1.61	1.591	1.47	1.559	2.765	5.049	3.549	3.004	3.956	2.248	2.419	2.775	2.487	2.397	2.439	2.356
October	1.659	1.559	1.446	1.634	2.856	3.470	3.55	3.052	3.81	2.218	2.461	2.775	2.464	2.405	2.449	2.319
November	1.70	1.505	1.397	1.769	3.021	3.444	3.549	3.084	3.566	2.129	2.445	2.775	2.481	2.433	2.453	2.299
December	1.725	1.463	1.366	1.941	3.278	3.441	3.461	3.11	3.114	2.107	2.439	2.775	2.540	2.450	2.453	2.310
Average	*1.529*	*1.663*	*1.434*	*1.534*	*2.671*	*4.188*	*3.542*	*3.115*	*3.675*	*2.532*	*2.220*	*2.738*	*2.609*	*2.465*	*2.439*	*2.357*

Billets and Finished Steel

Bessemer Steel Billets at Pittsburgh, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$20.00	$28.30	$20.13	$19.25	$32.00	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.30	$40.00	$37.00	$35.00	$35.00
February	20.00	28.50	21.00	19.50	33.50	65.00	47.50	43.50	55.25	42.25	28.00	39.63	40.00	37.00	35.00	33.00
March	19.75	28.50	21.00	19.70	42.40	66.25	47.50	42.25	60.00	38.40	28.00	44.38	40.00	36.70	35.00	34.00
April	20.00	28.50	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25
May	20.80	27.37	20.00	20.00	45.00	86.00	47.50	38.50	60.00	37.00	34.00	44.60	38.50	35.25	35.00	33.00
June	20.87	26.50	19.50	20.50	43.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00
July	21.50	26.60	19.00	21.38	41.00	100.00	47.50	38.50	62.50	32.25	35.00	42.50	38.00	35.00	35.00	33.00
August	22.12	26.00	20.25	23.13	44.20	86.00	47.50	38.50	61.00	29.60	36.10	42.50	37.75	35.00	35.00	33.00
September	23.62	24.87	21.00	24.10	45.00	66.25	47.50	38.50	58.74	29.00	39.50	41.88	36.40	35.00	35.00	33.00
October	26.00	23.30	20.00	24.63	46.25	49.38	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00
November	27.00	21.00	19.25	26.50	52.00	47.50	47.50	41.38	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00
December	27.00	20.00	19.00	30.60	57.50	47.50	45.50	46.00	43.50	29.00	36.50	40.00	36.00	35.00	35.00	33.00
Average	*22.39*	*25.79*	*20.08*	*22.44*	*43.95*	*70.78*	*47.33*	*40.51*	*56.22*	*34.46*	*33.95*	*41.70*	*37.99*	*35.23*	*35.00*	*33.27*

Open-Hearth Steel Billets at Pittsburgh, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$20.00	$28.90	$20.25	$19.25	$33.00	$63.00	$47.50	$43.50	$48.00	$43.50	$28.00	$37.50	$40.00	$38.00	$35.00	$35.00
February	20.00	29.00	21.00	19.50	34.75	65.00	47.50	43.50	55.25	41.00	28.00	39.63	40.00	38.00	35.00	33.00
March	19.39	29.00	21.00	19.70	42.60	66.25	47.50	42.25	60.00	38.50	28.00	44.39	40.00	36.70	35.00	34.00
April	20.00	29.00	20.80	20.00	45.00	73.75	47.50	38.50	60.00	37.50	29.50	45.00	40.00	35.50	35.00	33.25
May	20.25	27.63	20.00	20.00	43.40	86.00	47.50	38.50	60.00	37.00	34.00	45.00	38.50	35.25	35.00	33.00
June	20.75	26.50	19.40	20.50	41.50	98.75	47.50	38.50	61.00	37.00	35.00	42.63	38.00	35.00	35.00	33.00
July	21.63	26.60	19.00	21.88	42.75	100.00	47.50	38.50	65.00	32.25	35.00	42.50	38.00	35.00	35.00	33.00
August	22.63	25.39	20.25	23.50	45.00	82.50	47.50	38.50	61.00	29.60	35.50	42.50	37.75	35.00	35.00	33.00
September	24.13	24.13	21.00	24.60	45.00	66.25	47.50	38.50	58.75	29.00	39.50	41.88	36.40	35.00	35.00	33.00
October	26.70	23.30	20.00	25.25	46.25	50.50	47.50	38.50	55.00	29.00	40.00	40.00	35.75	34.25	35.00	33.00
November	27.50	21.00	19.25	27.25	52.00	47.50	47.50	41.39	49.70	29.00	37.75	40.00	35.50	34.75	35.00	33.00
December	27.75	20.00	19.00	31.80	57.50	47.50	45.50	46.40	43.50	29.00	36.50	44.00	36.00	35.00	35.00	33.00
Average	*22.56*	*25.87*	*20.08*	*22.77*	*44.06*	*70.58*	*47.33*	*40.54*	*56.43*	*34.36*	*33.90*	*41.75*	*37.99*	*35.62*	*35.00*	*33.27*

Wire Rods at Pittsburgh

No. 5 Bessemer wire rods, per gross ton. The quotations for November and December, 1917, and all of 1918, are Government prices and apply also to open-hearth rods

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$24.37	$30.00	$25.50	$25.00	$43.00	$75.00	$57.00	$57.00	$60.00	$57.00	$36.00	$47.00	$51.00	$48.00	$45.00	$45.00
February	25.00	30.00	26.38	25.00	48.00	77.50	57.00	57.00	63.75	54.50	35.75	49.38	51.00	48.00	45.00	43.00
March	25.00	30.00	26.50	25.00	54.80	81.00	57.00	55.75	70.00	52.00	36.00	50.00	51.00	48.00	45.00	43.00
April	25.00	30.00	26.00	25.00	60.00	85.00	57.00	52.00	70.00	49.00	38.00	50.25	51.00	47.00	45.00	42.25
May	25.00	30.00	25.50	25.00	60.00	86.00	57.00	52.00	72.50	48.00	38.00	51.00	48.75	46.00	45.00	42.00
June	25.00	29.50	24.50	25.00	53.75	92.50	57.00	52.00	75.00	48.00	38.50	51.00	48.00	45.60	45.00	42.00
July	25.00	28.30	24.50	25.63	53.75	96.25	57.00	52.00	75.00	43.00	40.00	51.00	48.00	45.00	45.00	42.25
August	25.80	28.00	25.00	27.00	55.00	94.00	57.00	52.00	75.00	41.80	42.40	51.00	46.50	45.00	45.00	43.00
September	27.00	27.37	26.20	29.40	55.00	88.75	57.00	52.00	75.00	39.50	46.25	51.00	46.00	45.00	45.00	43.00
October	28.50	26.60	25.88	31.75	55.00	77.25	57.00	52.00	75.00	40.50	45.00	51.00	45.50	45.00	45.00	42.75
November	29.75	25.87	25.25	36.25	63.00	57.00	57.00	54.50	66.40	40.00	45.00	51.00	45.00	45.00	45.00	41.00
December	30.00	25.17	25.00	39.50	68.75	57.00	57.00	59.50	57.00	38.00	45.00	51.00	48.00	45.00	45.00	40.00
Average	*26.29*	*28.40*	*25.52*	*28.29*	*55.84*	*79.77*	*57.00*	*53.98*	*69.55*	*45.94*	*40.49*	*50.39*	*48.31*	*46.05*	*45.00*	*42.44*

Plain Wire, Base, at Pittsburgh, Cents a Pound

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	1.51	1.37	1.55	1.35	1.34	1.98	2.95	3.25	3.25	3.25	3.25	2.25	2.45	2.75	2.60	2.50	2.49
February	1.55	1.40	1.55	1.40	1.39	2.10	2.95	3.25	3.25	3.50	3.13	2.20	2.63	2.75	2.60	2.50	2.41
March	1.57	1.40	1.56	1.40	1.40	2.25	3.11	3.25	3.19	3.50	3.00	2.25	2.65	2.75	2.60	2.50	2.40
April	1.60	1.40	1.60	1.40	1.37	2.25	3.23	3.25	3.00	3.50	3.00	2.25	2.68	2.75	2.50	2.50	2.40
May	1.60	1.40	1.60	1.36	1.35	2.45	3.45	3.25	3.00	3.50	3.00	2.25	2.75	2.68	2.50	2.50	2.40
June	1.55	1.40	1.60	1.30	1.35	2.45	3.70	3.25	3.00	3.50	2.75	2.25	2.75	2.65	2.49	2.50	2.40
July	1.50	1.42	1.58	1.32	1.39	2.45	3.95	3.25	3.00	3.50	2.56	2.25	2.75	2.63	2.50	2.50	2.40
August	1.50	1.46	1.48	1.36	1.43	2.53	3.95	3.25	3.00	3.69	2.50	2.29	2.75	2.56	2.50	2.50	2.40
September	1.46	1.50	1.47	1.40	1.54	2.55	3.95	3.25	3.00	3.75	2.58	2.39	2.75	2.53	2.50	2.50	2.40
October	1.44	1.50	1.41	1.40	1.65	2.60	3.25	3.25	3.17	3.75	2.60	2.45	2.75	2.50	2.50	2.50	2.40
November	1.37	1.50	1.39	1.39	1.72	2.80	3.25	3.25	3.29	3.65	2.56	2.45	2.75	2.50	2.50	2.50	2.40
December	1.34	1.53	1.35	1.31	1.89	2.95	3.25	3.25	3.21	3.25	2.44	2.45	2.75	2.60	2.50	2.50	2.40
Average	*1.50*	*1.44*	*1.51*	*1.37*	*1.48*	*2.47*	*3.43*	*3.25*	*3.11*	*3.53*	*2.78*	*2.31*	*2.70*	*2.64*	*2.52*	*2.50*	*2.41*

Wire Nails at Pittsburgh, Dollars a Keg of 100 Lb.

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$2.00	$2.05	$1.95	$1.85	$1.71	$1.57	$1.75	$1.54	$1.54	$2.13	$3.00	$3.50	$3.50	$4.50	$3.25	$2.50	$2.70	$3.00	$2.85	$2.65	$2.64
February	2.00	2.05	1.95	1.85	1.75	1.60	1.75	1.60	1.57	2.25	3.00	3.50	3.50	4.50	3.21	2.40	2.78	3.00	2.85	2.65	2.56
March	2.00	2.05	1.95	1.85	1.79	1.60	1.76	1.60	1.60	2.40	3.20	3.50	3.44	4.00	3.02	2.40	2.83	3.00	2.85	2.65	2.55
April	2.00	2.05	1.87	1.85	1.80	1.60	1.80	1.60	1.56	2.40	3.28	3.50	3.25	4.00	3.13	2.40	2.93	3.00	2.80	2.65	2.55
May	2.00	2.05	1.65	1.82	1.80	1.60	1.80	1.56	1.55	2.50	3.50	3.50	3.25	4.00	3.05	2.40	3.00	2.93	2.75	2.65	2.50
June	2.00	1.97	1.70	1.80	1.75	1.60	1.80	1.50	1.55	2.50	3.75	3.50	3.25	4.00	3.00	2.40	3.00	2.90	2.68	2.65	2.50
July	2.00	1.95	1.72	1.75	1.70	1.62	1.70	1.52	1.60	2.50	4.00	3.50	3.25	4.00	2.81	2.40	3.00	2.88	2.65	2.65	2.53
August	2.00	1.95	1.80	1.70	1.69	1.66	1.65	1.56	1.61	2.58	4.00	3.50	3.25	4.25	2.75	2.48	3.00	2.81	2.65	2.65	2.55
September	2.05	1.95	1.80	1.70	1.65	1.70	1.65	1.60	1.69	2.60	4.00	3.50	3.25	4.25	2.86	2.63	3.00	2.78	2.65	2.65	2.55
October	2.05	1.95	1.80	1.70	1.64	1.70	1.63	1.60	1.80	2.63	...	3.50	3.31	4.25	2.90	2.70	3.00	2.75	2.63	2.65	2.54
November	2.05	1.95	1.80	1.70	1.55	1.70	1.59	1.50	1.87	2.85	3.50	3.50	3.50	4.05	2.84	2.70	3.00	2.75	2.65	2.65	2.50
December	2.05	1.95	1.85	1.70	1.53	1.72	1.55	1.51	2.04	3.00	3.50	3.50	4.12	3.25	2.69	2.70	3.00	2.85	2.65	2.65	2.50
Average	*2.02*	*1.99*	*1.82*	*1.77*	*1.70*	*1.64*	*1.70*	*1.56*	*1.67*	*2.53*	*3.52*	*3.50*	*3.41*	*4.09*	*2.96*	*2.51*	*2.94*	*2.89*	*2.72*	*2.65*	*2.54*

Steel Rails at Mill, Open-Hearth, Dollars a Gross Ton

The extra $2 a gross ton, which was for many years charged for open-hearth rails, was annulled with the rail price announced Oct. 22, 1921

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$30.00	$30.00	$30.00	$30.00	$30.00	$40.00	$57.00	$57.00	$47.00	$47.00	$40.00	$43.00	$43.00	$43.00	$43.00	$43.00
February	30.00	30.00	30.00	30.00	30.00	40.00	57.00	57.00	47.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
March	30.00	30.00	30.00	30.00	30.00	40.00	57.00	54.50	49.50	47.00	40.00	43.00	43.00	43.00	43.00	43.00
April	30.00	30.00	30.00	30.00	30.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
May	30.00	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
June	30.00	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
July	30.00	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
August	30.00	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
September	30.00	30.00	30.00	30.00	35.00	40.00	57.00	47.00	57.00	47.00	40.00	43.00	43.00	43.00	43.00	43.00
October	30.00	30.00	30.00	30.00	35.00	....	57.00	47.00	57.00	45.25	43.00	43.00	43.00	43.00	43.00	43.00
November	30.00	30.00	30.00	30.00	38.00	....	57.00	47.00	57.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
December	30.00	30.00	30.00	30.00	40.00	....	57.00	47.00	53.00	40.00	43.00	43.00	43.00	43.00	43.00	43.00
Average	*30.00*	*30.00*	*30.00*	*30.00*	*34.00*	*40.00*	*57.00*	*49.29*	*54.38*	*45.69*	*40.75*	*43.00*	*43.00*	*43.00*	*43.00*	*43.00*

Soft Steel Bars at Pittsburgh, Cents a Pound

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January ..	1.60	1.60	1.40	1.50	1.40	1.15	1.70	1.20	1.10	2.03	3.15	2.90	2.70	2.75	2.35	1.50	2.04	2.40	2.10	2.00	1.98
February ..	1.60	1.60	1.35	1.50	1.40	1.12	1.70	1.20	1.10	2.31	3.25	2.90	2.70	3.00	2.15	1.39	2.20	2.40	2.10	2.00	1.90
March	1.60	1.60	1.20	1.45	1.40	1.10	1.85	1.20	1.15	2.65	3.63	2.90	2.61	3.63	2.00	1.39	2.39	2.40	2.10	2.00	1.90
April	1.60	1.60	1.15	1.45	1.40	1.16	1.84	1.15	1.20	2.88	3.75	2.90	2.35	3.75	2.05	1.50	2.50	2.29	2.05	2.00	1.89
May	1.60	1.60	1.19	1.45	1.37	1.20	1.70	1.14	1.20	3.00	4.00	2.90	2.35	3.63	2.10	1.58	2.40	2.24	2.00	1.95	1.85
June	1.60	1.45	1.20	1.45	1.25	1.20	1.60	1.11	1.21	2.75	4.25	2.90	2.35	3.50	2.05	1.70	2.40	2.20	2.00	2.00	1.81
July	1.60	1.40	1.27	1.45	1.23	1.25	1.50	1.12	1.25	2.63	4.50	2.90	2.35	3.50	1.84	1.70	2.40	2.15	2.00	2.00	1.80
August	1.60	1.40	1.32	1.40	1.20	1.30	1.40	1.19	1.30	2.56	4.30	2.90	2.35	3.25	1.74	1.88	2.40	2.13	1.95	2.00	1.80
September..	1.60	1.40	1.39	1.40	1.19	1.37	1.40	1.20	1.34	2.60	4.00	2.90	2.35	3.25	1.63	2.00	2.40	2.04	1.92	2.00	1.78
October ...	1.60	1.40	1.51	1.40	1.12	1.45	1.39	1.15	1.44	2.75	2.90	2.90	2.39	3.13	1.55	2.00	2.40	2.00	2.00	2.00	1.75
November ..	1.60	1.40	1.50	1.40	1.08	1.55	1.29	1.10	1.62	2.83	2.90	2.90	2.69	2.87	1.50	2.00	2.40	2.03	2.00	2.00	1.77
December ..	1.60	1.40	1.50	1.40	1.12	1.66	1.21	1.07	1.84	3.00	2.90	2.80	2.75	2.35	1.50	2.00	2.40	2.10	2.00	2.00	1.80
Average..	*1.60*	*1.49*	*1.33*	*1.44*	*1.26*	*1.29*	*1.55*	*1.15*	*1.31*	*2.67*	*3.63*	*2.89*	*2.50*	*3.22*	*1.87*	*1.72*	*2.36*	*2.20*	*2.02*	*2.00*	*1.84*

Tank Plates at Pittsburgh, Cents a Pound

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January ...	1.70	1.70	1.60	1.55	1.40	1.15	1.75	1.20	1.10	2.25	4.45	3.25	3.00	2.72	2.65	1.48	2.06	2.50	2.00	1.86	1.90
February ..	1.70	1.70	1.52	1.55	1.40	1.11	1.71	1.20	1.10	2.56	4.88	3.25	3.00	3.50	2.33	1.39	2.23	2.45	2.00	1.80	1.86
March	1.70	1.70	1.30	1.55	1.40	1.12	1.70	1.18	1.10	3.10	5.25	3.25	2.91	3.63	2.04	1.39	2.39	2.39	2.00	1.86	1.85
April	1.70	1.70	1.27	1.55	1.40	1.21	1.68	1.15	1.15	3.56	5.88	3.25	2.65	3.75	2.10	1.48	2.50	2.28	2.00	1.90	1.85
May	1.70	1.70	1.29	1.51	1.39	1.25	1.60	1.12	1.15	3.75	6.60	3.25	2.65	3.75	2.20	1.56	2.50	2.20	2.00	1.86	1.84
June	1.70	1.62	1.25	1.48	1.35	1.25	1.45	1.10	1.16	3.63	8.00	3.25	2.65	3.55	1.95	1.63	2.50	2.18	1.92	1.88	1.80
July	1.70	1.60	1.33	1.41	1.35	1.30	1.45	1.10	1.22	3.44	9.00	3.25	2.65	3.38	1.85	1.70	2.50	2.09	1.90	1.90	1.80
August	1.70	1.60	1.40	1.40	1.34	1.35	1.44	1.18	1.26	3.70	8.80	3.25	2.65	3.25	1.78	1.88	2.50	1.95	1.85	1.90	1.80
September..	1.70	1.60	1.46	1.40	1.29	1.47	1.40	1.20	1.34	4.00	8.00	3.25	2.53	3.25	1.64	2.13	2.50	1.82	1.80	1.90	1.78
October ...	1.70	1.60	1.50	1.40	1.17	1.53	1.36	1.14	1.44	4.00	3.25	3.25	2.61	3.09	1.60	2.11	2.50	1.80	1.80	1.90	1.75
November ..	1.70	1.60	1.54	1.40	1.13	1.59	1.26	1.08	1.65	4.15	3.25	3.25	2.65	2.81	1.54	1.99	2.50	1.83	1.86	1.90	1.77
December ..	1.70	1.60	1.55	1.40	1.15	1.60	1.20	1.05	2.04	4.25	3.25	3.13	2.65	2.65	1.50	1.95	2.50	1.92	1.90	1.90	1.80
Average..	*1.70*	*1.64*	*1.42*	*1.47*	*1.31*	*1.33*	*1.50*	*1.14*	*1.31*	*3.53*	*5.88*	*3.24*	*2.72*	*3.28*	*1.93*	*1.72*	*2.43*	*2.12*	*1.91*	*1.88*	*1.82*

Structural Shapes at Pittsburgh, Cents a Pound

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January ...	1.70	1.70	1.60	1.55	1.40	1.15	1.75	1.20	1.10	1.90	3.25	3.00	2.80	2.47	2.45	1.50	2.06	2.50	2.10	1.90	1.98
February ..	1.70	1.70	1.52	1.51	1.40	1.11	1.71	1.20	1.10	2.06	3.25	3.00	2.80	2.70	2.26	1.39	2.20	2.50	2.10	1.90	1.90
March	1.70	1.70	1.30	1.50	1.40	1.15	1.70	1.19	1.10	2.40	3.54	3.00	2.71	3.13	2.08	1.39	2.39	2.39	2.10	1.90	1.90
April	1.70	1.70	1.27	1.50	1.40	1.21	1.68	1.15	1.20	2.55	3.88	3.00	2.45	3.25	2.10	1.50	2.50	2.29	2.05	1.90	1.88
May	1.70	1.70	1.27	1.50	1.39	1.25	1.50	1.14	1.20	2.60	4.00	3.00	2.45	3.10	2.20	1.56	2.50	2.24	2.00	1.90	1.80
June	1.70	1.62	1.25	1.48	1.35	1.25	1.45	1.11	1.20	2.53	4.31	3.00	2.45	3.10	2.10	1.63	2.50	2.20	2.00	1.94	1.80
July	1.70	1.60	1.33	1.41	1.35	1.30	1.45	1.12	1.25	2.50	4.50	3.00	2.45	3.10	1.93	1.70	2.50	2.09	2.00	2.00	1.80
August	1.70	1.60	1.40	1.40	1.35	1.35	1.45	1.19	1.30	2.52	4.30	3.00	2.45	3.10	1.82	1.88	2.50	2.00	1.95	2.00	1.80
September .	1.70	1.60	1.46	1.40	1.34	1.42	1.41	1.20	1.35	2.64	4.00	3.00	2.45	3.10	1.64	2.00	2.50	2.00	1.90	2.00	1.78
October ...	1.70	1.60	1.50	1.40	1.21	1.48	1.37	1.15	1.44	2.75	3.00	3.00	2.45	3.05	1.60	2.00	2.50	1.93	1.90	2.00	1.75
November .	1.70	1.60	1.54	1.40	1.13	1.57	1.29	1.10	1.60	2.86	3.00	3.00	2.45	2.89	1.54	2.00	2.50	2.00	1.90	2.00	1.77
December ..	1.70	1.60	1.55	1.40	1.15	1.60	1.25	1.07	1.78	3.25	3.00	2.90	2.45	2.45	1.50	2.00	2.50	2.10	1.90	2.00	1.80
Average..	*1.70*	*1.64*	*1.42*	*1.45*	*1.32*	*1.32*	*1.50*	*1.15*	*1.31*	*2.55*	*3.67*	*2.99*	*2.53*	*2.95*	*1.94*	*1.71*	*2.43*	*2.19*	*1.99*	*1.95*	*1.83*

No. 28 Black Sheets, at Pittsburgh, Cents a Pound

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January ...	2.60	2.52	2.50	2.40	2.20	1.90	2.31	1.87	1.80	2.60	4.50	5.00	4.70	4.48	4.35	3.00	3.35	3.83	3.60	3.35	3.16
February ..	2.60	2.50	2.50	2.40	2.20	1.87	2.35	1.95	1.80	2.60	4.69	5.00	4.70	5.00	4.21	3.00	3.46	3.85	3.50	3.28	3.05
March	2.60	2.50	2.25	2.40	2.20	1.80	2.35	1.95	1.80	2.71	4.94	5.00	4.61	5.50	3.88	3.00	3.71	3.78	3.44	3.25	3.00
April	2.60	2.50	2.20	2.40	2.20	1.86	2.35	1.91	1.80	2.85	5.75	5.00	4.35	5.50	3.88	3.11	4.00	3.71	3.35	3.25	2.99
May	2.60	2.50	2.20	2.40	2.20	1.90	2.30	1.85	1.79	2.89	7.00	5.00	4.35	5.50	4.00	3.15	3.88	3.60	3.20	3.18	3.11
June	2.60	2.50	2.20	2.40	2.00	1.90	2.27	1.81	1.75	2.90	7.88	5.00	4.35	5.50	3.80	3.15	3.85	3.53	3.15	3.10	3.25
July	2.60	2.50	2.20	2.24	2.00	1.95	2.25	1.80	1.75	2.90	8.50	5.00	4.35	6.75	3.31	3.15	3.81	3.46	3.13	3.10	3.25
August	2.60	2.50	2.20	2.21	1.99	2.02	2.21	1.86	1.85	2.90	8.50	5.00	4.35	7.50	2.90	3.23	3.75	3.45	3.15	3.10	3.25
September .	2.60	2.50	2.26	2.15	1.91	2.07	2.14	1.95	1.90	2.93	8.50	5.00	4.35	7.38	2.81	3.35	3.75	3.50	3.14	3.15	3.25
October ...	2.60	2.50	2.30	2.20	1.85	2.21	2.04	1.94	2.03	3.23	...	5.05	4.35	6.69	3.00	3.47	3.75	3.50	3.11	3.23	3.15
November..	2.60	2.50	2.30	2.20	1.85	2.25	1.97	1.87	2.25	3.65	5.00	5.00	4.35	5.77	2.86	3.35	3.75	3.50	3.25	3.25	3.03
December ..	2.60	2.50	2.40	2.19	1.84	2.25	1.89	1.82	2.50	4.31	5.00	4.85	4.35	4.35	3.00	3.35	3.75	3.54	3.33	3.25	3.03
Average..	*2.60*	*2.50*	*2.29*	*2.30*	*2.04*	*2.00*	*2.20*	*1.88*	*1.92*	*3.04*	*6.39*	*4.99*	*4.43*	*5.83*	*3.50*	*3.19*	*3.73*	*3.60*	*3.28*	*3.21*	*3.13*

Automobile Body Sheets, Base No. 22 Gage, f.o.b. Pittsburgh, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927
January	5.20	4.35	4.70	5.35	4.75	4.50	4.18
February ...	5.20	4.35	4.78	5.35	4.68	4.43	4.15
March	5.20	4.35	5.00	5.35	4.46	4.40	4.15
April	5.20	4.40	5.00	5.25	4.40	4.33	4.15
May	5.20	4.45	5.35	5.10	4.40	4.29	4.15
June	4.95	4.50	5.35	5.10	4.22	4.20	4.25
July	4.70	4.60	5.35	5.06	4.15	4.20	4.25
August	4.65	4.75	5.35	4.75	4.25	4.20	4.25
September ..	4.45	4.85	5.35	4.72	4.25	4.25	4.25
October	4.55	4.85	5.35	4.60	4.29	4.25	4.15
November ...	4.35	4.85	5.35	4.60	4.40	4.25	4.12
December ...	4.35	4.70	5.35	4.75	4.50	4.25	4.00
Average ..	*4.83*	*4.58*	*5.19*	*5.00*	*4.39*	*4.30*	*4.17*

Blue Annealed Sheets, Base Nos. 9 and 10 Gage, Cents a Pound, at Pittsburgh

	1921	1922	1923	1924	1925	1926	1927
January	3.55	2.25	2.52	3.00	2.70	2.50	2.25
February ...	3.29	2.25	2.64	3.00	2.70	2.50	2.20
March	3.04	2.25	2.95	2.93	2.69	2.50	2.20
April	3.05	2.36	3.25	2.86	2.53	2.43	2.18
May	3.10	2.40	3.20	2.80	2.40	2.40	2.22
June	2.88	2.40	3.00	2.76	2.31	2.32	2.25
July	2.55	2.40	3.00	2.68	2.30	2.30	2.25
August	2.31	2.44	3.00	2.63	2.30	2.30	2.25
September ..	2.23	2.50	3.00	2.69	2.25	2.30	2.25
October	2.25	2.60	3.00	2.70	2.26	2.30	2.14
November ...	2.25	2.55	3.00	2.70	2.40	2.30	2.10
December ...	2.25	2.50	3.00	2.70	2.50	2.30	2.10
Average ..	*2.73*	*2.41*	*2.96*	*2.79*	*2.45*	*2.37*	*2.20*

Hot-Rolled and Cold-Rolled Strip Steel

Quoted in Cents a Pound, at Pittsburgh

	HOT-ROLLED STRIP STEEL							COLD-ROLLED STRIP STEEL							
	1920	1921	1922	1923	1924	1925	1926	1927	1920	1921	1922	1923	1924	1925	1926	1927
January	3.45	3.30	2.00	2.75	3.00	2.25	2.30	2.34	6.00	6.25	3.50	4.50	5.00	4.00	3.90	2.95
February	4.63	3.11	1.84	2.86	3.00	2.35	2.30	2.21	7.00	6.06	3.50	4.69	4.75	4.00	3.90	2.80
March	5.00	2.93	1.81	3.18	2.93	2.40	2.30	2.30	7.00	5.83	3.50	5.00	4.75	4.00	3.90	2.92
April	5.25	2.76	1.98	3.30	2.75	2.40	2.30	2.30	7.75	5.54	3.61	5.25	4.75	4.00	3.79	3.00
May	5.50	2.53	2.20	3.30	2.75	2.20	2.30	2.30	8.50	4.98	3.71	5.25	4.50	3.94	3.75	3.00
June	5.50	2.50	2.40	3.23	2.50	2.20	2.30	2.30	8.50	4.88	4.00	5.19	4.50	3.53	3.72	3.19
July	5.50	2.46	2.50	3.00	2.50	2.20	2.30	2.30	8.50	4.25	4.00	5.00	4.30	3.63	3.60	3.25
August	5.50	2.23	2.60	3.00	2.35	2.20	2.30	2.30	8.50	3.96	4.10	5.00	4.13	3.75	3.60	3.25
September	5.50	2.00	2.75	3.00	2.25	2.20	2.30	2.30	8.50	3.78	4.25	5.00	4.00	3.75	3.50	3.25
October	5.25	2.00	2.90	3.00	2.25	2.23	2.30	2.19	8.25	3.75	4.50	5.00	4.00	3.75	3.25	3.00
November	4.70	2.00	2.83	3.00	2.25	2.30	2.30	2.19	8.00	3.75	4.50	4.98	4.00	3.90	3.25	3.00
December	3.65	2.00	2.75	2.88	2.25	2.30	2.30	2.03	6.63	3.75	4.50	4.91	4.00	3.90	3.00	3.00
Average	*4.95*	*2.49*	*2.38*	*3.04*	*2.57*	*2.27*	*2.30*	*2.26*	*7.76*	*4.73*	*3.97*	*4.98*	*4.39*	*3.85*	*3.60*	*3.05*

Wrought Iron and Steel Pipe Prices

Computed from discounts as per list, with "trimmings," for carload lots; price for base size pipe, ¾ to 3-in.

Steel Pipe, per Net Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$32.30	$36.10	$35.20	$34.20	$41.39	$64.84	$88.92	$83.36	$80.64	$77.30	$51.87	$61.13	$70.30	$70.30	$70.30	$70.30
February	32.30	36.10	36.09	35.42	43.63	66.95	88.92	83.36	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30
March	32.30	36.10	36.12	36.10	47.51	72.07	88.92	81.06	83.36	76.88	51.87	66.50	70.30	70.30	70.30	70.30
April	32.30	36.60	35.54	36.10	51.25	81.51	88.92	76.88	83.36	71.63	51.87	68.02	70.30	70.30	70.30	70.30
May	32.30	37.20	35.20	38.00	53.72	92.62	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30
June	34.20	38.00	35.20	38.00	53.72	95.21	88.92	76.88	83.36	67.62	51.87	70.30	70.30	70.30	70.30	70.30
July	34.69	38.00	35.20	38.00	53.72	105.59	88.92	76.88	83.36	64.63	51.87	70.30	70.30	70.30	70.30	70.30
August	36.10	36.53	35.20	38.00	53.72	105.59	88.92	76.88	83.36	63.91	54.74	70.30	70.30	70.30	70.30	70.30
September	37.43	36.10	35.20	38.00	55.21	105.59	88.92	76.88	83.36	60.21	57.43	70.30	70.30	70.30	70.30	70.30
October	38.00	35.95	35.20	38.00	55.58	105.59	88.92	76.88	83.36	56.50	58.74	70.30	70.30	70.30	70.30	69.54
November	38.00	35.20	34.23	39.90	56.57	91.70	88.92	76.88	83.36	56.50	61.13	70.30	70.30	70.30	70.30	68.79
December	38.00	35.20	34.20	39.90	61.01	88.92	88.92	76.88	83.36	53.96	61.13	70.30	70.30	70.30	70.30	68.79
Average	*34.92*	*36.42*	*35.22*	*37.47*	*52.25*	*81.73*	*88.92*	*78.31*	*83.13*	*66.14*	*54.69*	*68.71*	*70.30*	*70.30*	*70.30*	*70.00*

Wrought Iron Pipe, per Net Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$43.70	$49.40	$51.30	$51.30	$58.64	$83.36	$122.27	$116.71	$115.60	$135.06	$100.96	$122.56	$131.10	$131.10	$127.82	$127.82
February	43.70	49.40	51.30	51.30	62.16	85.48	122.27	116.71	119.49	136.16	100.96	127.82	131.10	131.10	127.82	127.82
March	43.70	49.40	51.30	51.30	66.03	90.65	122.27	114.41	119.49	136.16	100.96	127.82	131.10	127.82	127.82	127.82
April	43.70	50.00	51.30	51.30	69.78	101.89	122.27	110.22	119.49	125.66	100.96	129.02	131.10	127.82	127.82	127.82
May	43.70	50.48	51.30	53.20	72.25	113.00	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82
June	43.70	51.30	51.30	53.20	72.25	114.85	122.27	110.22	119.49	117.63	100.96	131.10	131.10	127.82	127.82	127.82
July	45.60	51.30	51.30	53.20	72.25	122.27	122.27	110.22	119.49	111.65	100.96	131.10	131.10	127.82	127.82	127.82
August	45.60	51.30	51.30	53.20	72.25	122.27	122.27	110.22	119.49	110.22	105.74	131.10	131.10	127.82	127.82	127.82
September	46.93	51.30	51.30	53.20	73.73	122.27	122.27	110.22	119.49	105.59	116.33	131.10	131.10	127.82	127.82	127.82
October	47.50	51.30	51.30	53.20	74.10	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82
November	47.50	51.30	51.30	55.10	75.07	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82
December	47.50	51.30	51.30	55.10	79.50	122.27	122.27	110.22	119.49	100.96	120.41	131.10	131.10	127.82	127.82	127.82
Average	*45.24*	*50.65*	*51.30*	*52.88*	*70.67*	*110.24*	*122.27*	*111.65*	*119.16*	*116.55*	*107.50*	*129.67*	*131.10*	*128.37*	*127.82*	*127.82*

Cast Iron Pipe Prices, 1912 to 1927

At New York, 6-In. per Net Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$22.00	$25.00	$22.00	$20.00	$29.00	$41.50	$55.35	$65.70	$66.30	$63.30	$47.30	$54.90	$61.60	$54.60	$50.60	$48.60
February	22.00	24.75	22.00	20.00	29.33	41.50	55.35	62.70	70.30	63.30	47.30	56.50	61.60	54.60	50.60	48.60
March	22.00	23.87	22.00	20.00	29.75	43.10	55.35	62.70	71.30	63.30	47.68	57.75	61.60	53.00	50.60	47.20
April	21.25	23.50	22.00	21.60	30.50	50.88	55.35	57.70	73.90	63.30	48.80	58.50	61.60	52.60	50.60	47.35
May	21.00	23.00	20.88	22.00	30.50	55.50	56.60	54.45	76.30	62.05	49.60	58.50	61.60	50.85	50.60	45.80
June	21.00	23.00	20.50	22.25	30.50	60.75	61.44	52.03	76.30	54.30	50.80	61.35	61.60	50.60	50.60	44.42
July	22.10	23.00	20.50	22.50	30.50	65.50	61.75	50.46	76.30	52.30	53.50	62.30	60.60	50.60	50.60	42.75
August	22.00	23.00	20.50	23.25	30.50	65.50	61.75	52.33	76.53	46.05	54.10	62.62	59.60	50.60	50.60	39.65
September	23.12	23.00	20.40	24.37	30.83	65.50	61.75	54.30	77.22	46.30	54.50	63.60	56.60	50.60	49.85	37.25
October	24.50	23.00	20.00	25.25	31.50	61.00	67.70	55.30	77.22	47.30	54.50	63.60	56.35	50.60	49.60	36.50
November	24.12	23.00	20.00	26.50	35.50	56.50	67.70	58.30	77.22	47.30	54.50	63.60*	55.60	50.60	49.60	36.25
December	24.62	22.33	20.00	27.60	41.00	56.50	67.70	61.30	68.87	47.30	54.75	63.60*	55.20	50.60	49.10	37.00
Average	*22.48*	*23.37*	*20.90*	*22.94*	*31.62*	*55.31*	*60.65*	*57.27*	*73.98*	*54.68*	*51.44*	*60.57*	*59.46*	*51.65*	*50.25*	*42.61*

*Concession of $2 to $3 per ton from this price to consumers willing to accept winter delivery.

Cast Iron Pipe, Delivered Chicago, 6-In. and Larger, per Net Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$24.67	$29.00	$25.00	$23.50	$29.00	$41.50	$54.30	$64.30	$67.55	$64.10	$42.50	$51.80	$56.20	$48.70	$49.20	$44.33
February	25.00	29.00	25.00	23.50	29.50	41.75	54.30	61.80	71.30	64.10	41.60	53.20	56.20	49.95	49.20	43.70
March	25.00	27.83	24.20	23.50	29.50	43.00	54.30	60.55	72.80	64.10	42.10	54.20	56.20	47.60	49.20	44.20
April	25.00	28.10	24.00	23.50	30.50	53.00	54.30	56.80	74.80	64.10	42.85	57.20	56.20	46.70	49.20	43.95
May	25.00	26.50	24.00	23.50	30.50	55.50	55.81	54.30	76.80	60.10	44.60	60.20	55.20	47.07	49.20	43.20
June	25.00	26.50	24.00	23.70	30.50	60.75	60.83	51.80	76.80	52.85	46.10	60.20	54.70	47.70	48.90	42.70
July	25.60	26.20	24.00	24.00	30.50	65.50	62.05	52.60	76.80	48.85	45.57	60.20	54.80	48.20	47.95	41.58
August	27.13	26.00	24.00	24.00	30.50	65.50	61.80	55.30	78.18	43.20	46.40	60.20	53.45	49.20	48.30	37.40
September	28.00	26.00	24.00	24.70	31.00	65.50	61.80	55.80	82.10	42.60	47.45	59.95	51.80	49.20	47.58	34.58
October	28.00	26.00	24.00	25.75	31.50	53.50	66.80	59.00	83.10	42.60	51.20	57.40	49.70	49.20	47.20	34.20
November	28.75	25.63	24.00	27.00	36.25	54.25	66.80	59.80	83.10	42.90	51.20	55.45	48.20	50.20	47.20	34.50
December	29.00	25.00	23.50	27.77	41.00	55.21	66.80	64.40	68.60	43.10	51.20	55.20	47.60	50.20	46.70	35.08
Average	*26.35*	*26.81*	*24.14*	*24.54*	*31.69*	*54.58*	*59.99*	*58.04*	*76.00*	*52.72*	*46.06*	*57.10*	*53.35*	*48.66*	*48.32*	*39.95*

Southern Ohio No. 2 Foundry Iron, per Gross Ton, at Cincinnati

	1921	1922	1923	1924	1925	1926	1927
January	$33.78	$22.15	$29.78	$25.18	$24.27	$23.27	$21.89
February	32.03	22.03	30.28	26.03	24.27	22.92	21.39
March	29.93	21.38	32.68	25.78	23.87	22.89	21.26
April	28.28	22.78	33.14	25.39	23.15	21.99	21.39
May	27.03	25.28	32.23	24.39	21.77	21.76	21.19
June	25.73	25.53	30.53	22.53	21.27	20.89	20.89
July	23.93	26.40	28.71	21.58	21.27	21.29	20.76
August	22.53	30.18	28.08	21.78	21.77	21.39	20.39
September	23.13	34.28	27.03	22.15	21.77	21.39	20.89
October	23.53	34.53	26.93	22.28	21.90	21.39	20.89
November	22.73	31.83	24.78	22.90	23.27	21.89	20.89
December	22.27	29.28	24.78	23.88	23.27	21.89	20.89
Average	*26.49*	*27.14*	*28.75*	*23.66*	*22.65*	*21.91*	*21.06*

Seven Years of Finished Iron and Steel, Chicago and Pittsburgh

Sheets, Bars and Beams at Chicago—Rivets, Cotton Ties and Cold-Finished Bars at Pittsburgh

Black Sheets, No. 28 Gage, at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927
January	4.73	3.38	3.69	4.17	3.75	3.50	3.45
February	4.57	3.38	3.69	4.19	3.75	3.50	3.23
March	4.40	3.38	3.90	4.14	3.75	3.50	3.25
April	4.21	3.46	4.25	4.03	3.65	3.48	3.25
May	4.38	3.53	4.19	3.99	3.48	3.40	3.37
June	4.15	3.53	4.19	3.99	3.32	3.31	3.40
July	3.76	3.49	4.19	3.84	3.35	3.30	3.40
August	3.33	3.57	4.19	3.84	3.35	3.30	3.40
September	3.19	3.69	4.12	3.93	3.35	3.33	3.40
October	3.34	3.69	4.09	3.65	3.31	3.43	3.30
November	3.38	3.69	4.09	3.68	3.43	3.50	3.19
December	3.38	3.69	4.09	3.75	3.50	3.50	3.15
Average	*3.86*	*3.54*	*4.06*	*3.93*	*3.50*	*3.42*	*3.32*

Common Bar Iron at Chicago, Cents a Pound

	1921	1922	1923	1924	1925	1926	1927
January	2.68	1.60	2.35	2.40	2.00	2.00	2.00
February	2.65	1.58	2.46	2.40	2.03	2.00	2.00
March	2.60	1.58	2.53	2.40	2.10	2.00	2.00
April	2.38	1.63	2.60	2.35	2.10	2.00	2.00
May	2.35	1.67	2.60	2.28	2.08	2.00	2.00
June	2.23	1.74	2.55	2.23	2.01	2.00	2.00
July	1.96	1.85	2.50	2.20	1.96	2.00	2.00
August	1.75	2.11	2.40	2.18	1.90	2.00	2.00
September	1.75	2.25	2.39	2.14	1.90	2.00	1.98
October	1.75	2.50	2.38	2.10	1.90	2.00	1.88
November	1.73	2.50	2.40	2.08	1.94	2.00	1.88
December	1.63	2.35	2.40	2.01	2.00	2.00	1.90
Average	*2.12*	*1.95*	*2.47*	*2.23*	*1.99*	*2.00*	*1.97*

Galvanized Steel Sheets, No. 28 Gage, at Chicago, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927
January	5.60	6.08	4.38	4.69	5.34	4.90	4.75	4.53
February	6.77	5.88	4.38	4.69	5.34	4.90	4.75	4.40
March	7.27	5.44	4.38	5.02	5.29	4.88	4.75	4.40
April	7.27	5.18	4.46	5.28	5.21	4.75	4.75	4.40
May	7.27	5.38	4.53	5.34	5.12	4.55	4.68	4.48
June	7.27	5.13	4.53	5.34	5.14	4.39	4.55	4.50
July	8.52	4.76	4.49	5.34	5.00	4.38	4.45	4.50
August	9.27	4.33	4.67	5.34	4.94	4.39	4.45	4.50
September	9.26	4.19	4.69	5.34	5.00	4.40	4.44	4.50
October	8.56	4.34	4.69	5.34	4.75	4.41	4.54	4.45
November	7.42	4.38	4.69	5.22	4.79	4.68	4.60	4.35
December	6.08	4.38	4.69	5.24	4.90	4.75	4.60	4.20
Average	*7.55*	*4.91*	*4.54*	*5.18*	*5.07*	*4.62*	*4.61*	*4.43*

Soft Steel Bars at Chicago, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927
January	2.96	2.73	1.60	2.08	2.50	2.13	2.10	2.10
February	3.45	2.57	1.53	2.21	2.50	2.20	2.10	2.03
March	3.57	2.40	1.55	2.45	2.50	2.20	2.10	2.00
April	3.70	2.43	1.60	2.84	2.38	2.15	2.10	2.00
May	3.45	2.48	1.66	2.74	2.30	2.10	2.10	2.00
June	3.45	2.37	1.75	2.60	2.25	2.10	2.10	2.00
July	3.45	2.21	1.75	2.60	2.19	2.10	2.10	2.00
August	3.47	1.96	2.05	2.60	2.13	2.10	2.10	1.98
September	3.50	1.78	2.10	2.50	2.02	2.10	2.10	1.90
October	3.31	1.75	2.10	2.50	2.00	2.10	2.10	1.85
November	3.04	1.67	2.10	2.50	2.05	2.10	2.10	1.87
December	2.73	1.60	2.10	2.50	2.10	2.10	2.10	1.90
Average	*3.34*	*2.16*	*1.83*	*2.51*	*2.24*	*2.12*	*2.10*	*1.97*

Blue Annealed Sheets, Nos. 9 and 10 Gage, at Chicago, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927
January	4.07	3.93	2.63	2.84	3.34	2.85	2.65	2.56
February	3.95	3.72	2.63	2.84	3.34	2.85	2.65	2.36
March	3.82	3.43	2.63	3.03	3.29	2.83	2.65	2.39
April	3.82	3.26	2.71	3.32	3.21	2.75	2.65	2.40
May	3.82	3.48	2.78	3.34	3.14	2.55	2.65	2.40
June	3.82	3.26	2.78	3.34	3.14	2.44	2.49	2.40
July	3.82	2.93	2.74	3.34	3.07	2.48	2.45	2.40
August	3.82	2.63	2.78	3.34	3.04	2.45	2.45	2.40
September	3.93	2.63	2.84	3.34	3.10	2.45	2.45	2.40
October	3.93	2.63	2.84	3.34	2.85	2.45	2.53	2.38
November	3.93	2.63	2.84	3.34	2.85	2.58	2.55	2.27
December	3.93	2.63	2.84	3.34	2.85	2.65	2.55	2.15
Average	*3.89*	*3.06*	*2.75*	*3.23*	*3.10*	*2.61*	*2.56*	*2.38*

Structural Steel Beams at Chicago, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927
January	2.72	2.83	1.60	2.18	2.60	2.23	2.10	2.10
February	3.18	2.67	1.53	2.31	2.60	2.30	2.10	2.03
March	3.50	2.50	1.55	2.52	2.60	2.30	2.10	2.00
April	3.50	2.53	1.60	2.84	2.50	2.25	2.10	2.00
May	3.50	2.58	1.66	2.84	2.45	2.20	2.10	2.00
June	3.45	2.48	1.75	2.70	2.39	2.18	2.10	2.00
July	3.25	2.28	1.75	2.70	2.27	2.10	2.10	2.00
August	3.14	1.99	2.05	2.70	2.20	2.10	2.10	1.94
September	3.23	1.79	2.20	2.60	2.06	2.10	2.10	1.90
October	3.20	1.75	2.20	2.60	2.00	2.10	2.10	1.85
November	3.07	1.69	2.20	2.60	2.15	2.10	2.10	1.87
December	2.83	1.63	2.20	2.60	2.20	2.10	2.10	1.90
Average	*3.22*	*2.23*	*1.86*	*2.59*	*2.33*	*2.17*	*2.10*	*1.97*

Rail Steel Bars at Chicago Mill, Cents a Pound

	1920	1921	1922	1923	1924	1925	1926	1927
January	3.25	2.60	1.56	2.00	2.30	2.03	2.00	1.90
February	3.25	2.41	1.50	2.10	2.30	2.10	2.00	1.90
March	3.50	2.23	1.50	2.28	2.30	2.10	2.00	1.90
April	3.75	2.25	1.55	2.33	2.30	2.10	2.00	1.90
May	3.75	2.05	1.60	2.30	2.20	2.10	1.98	1.90
June	3.75	1.95	1.63	2.28	2.15	2.02	1.96	1.90
July	3.75	1.90	1.70	2.30	2.10	2.00	1.98	1.90
August	3.95	1.76	1.89	2.30	2.05	2.00	2.00	1.90
September	4.00	1.75	2.00	2.30	2.00	2.00	2.00	1.90
October	3.81	1.68	2.00	2.30	2.00	2.00	2.00	1.83
November	3.15	1.65	2.00	2.30	2.00	2.00	1.96	1.80
December	2.67	1.75	2.00	2.30	2.00	2.00	1.90	1.80
Average	*3.56*	*1.99*	*1.75*	*2.25*	*2.14*	*2.04*	*1.98*	*1.88*

Cold-Finished Steel Bars, Base per 100 Pounds, f.o.b. Pittsburgh

	1920	1921	1922	1923	1924	1925	1926	1927
January	$3.60	$3.60	$1.94	$2.53	$3.00	$2.80	$2.50	$2.30
February	3.85	3.60	1.90	2.73	2.95	2.80	2.50	2.30
March	5.00	3.20	1.80	2.85	2.98	2.72	2.50	2.38
April	5.00	3.05	1.85	3.00	3.00	2.70	2.50	2.40
May	5.00	3.10	1.94	3.25	2.90	2.70	2.50	2.40
June	5.00	3.00	2.03	3.25	2.90	2.60	2.50	2.33
July	6.00	2.69	2.10	3.25	2.84	2.60	2.50	2.20
August	6.00	2.40	2.23	3.25	2.80	2.50	2.50	2.20
September	4.69	2.36	2.50	3.25	2.74	2.46	2.50	2.15
October	4.06	2.18	2.50	3.10	2.70	2.40	2.40	2.10
November	3.92	2.09	2.50	2.95	2.70	2.48	2.30	2.10
December	3.60	2.00	2.50	3.00	2.78	2.50	2.30	2.10
Average	*4.64*	*2.77*	*2.15*	*3.03*	*2.86*	*2.61*	*2.46*	*2.25*

Cotton Tie Prices for Twenty-Three Years

(Per Bundle of 45-Lb., f.o.b. Pittsburgh)

1905	$0.85	1913	$0.80	1920	$2.00
1906	0.85	1914	0.65	1921	1.30
1907	0.95	1915	0.85	1922	1.10
1908	0.85	1916	1.35	1923	1.60
1909	0.70	1917	2.10	1924	*1.40
1910	0.75	1918	2.10	1925	†1.25
1911	0.75	1919	1.70	1926	‡1.20
1912	0.70			1927	**1.20

*F.o.b. Atlantic and Gulf ports.
†F.o.b. Gulf ports; $1.28, f.o.b. Atlantic ports.
‡F.o.b. Gulf ports; $1.22, f.o.b. Atlantic ports.
**F.o.b. Gulf ports; $1.21, f.o.b. Atlantic ports.

Large Structural Rivets, Base per 100 Pounds, f.o.b. Pittsburgh

	1920	1921	1922	1923	1924	1925	1926	1927
January	$4.11	$4.13	$2.25	$3.00	$2.90	$2.60	$2.60	$2.34
February	4.33	3.90	2.18	3.00	2.75	2.60	2.53	2.30
March	4.50	3.78	2.00	3.25	2.75	2.60	2.50	2.30
April	4.50	3.55	2.10	3.25	2.65	2.58	2.50	2.75
May	4.50	3.32	2.24	3.25	2.65	2.45	2.50	2.75
June	4.50	3.03	2.36	3.25	2.61	2.40	2.50	2.75
July	4.50	2.71	2.46	3.13	2.60	2.40	2.50	2.75
August	4.50	2.50	2.65	3.00	2.55	2.40	2.50	2.75
September	4.50	2.24	3.00	2.95	2.60	2.40	2.48	2.75
October	4.75	2.36	3.12	2.75	2.58	2.40	2.45	2.75
November	4.70	2.25	3.10	2.68	2.60	2.60	2.45	3.00
December	4.44	2.25	3.00	2.90	2.60	2.60	2.40	2.75
Average	*4.49*	*3.00*	*2.55*	*3.02*	*2.65*	*2.50*	*2.50*	*2.66*

Monthly Averages of Ferroalloy Quotations

Ferromanganese (80 *Per Cent*) *Prices in Dollars a Gross Ton, at Seaboard*

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$41.00	$68.00	$44.40	$68.00	$150.00	$175.00	$250.00	$255.00	$146.00	$112.50	$58.35	$105.00	$108.70	$112.50	$115.00	$100.00
Feb.	41.00	65.00	39.25	69.75	207.50	231.25	250.00	215.00	172.50	100.00	60.42	107.50	107.50	115.00	115.00	100.00
March	41.00	65.00	38.50	100.00	349.60	290.00	250.00	175.00	216.25	96.00	62.50	113.75	107.50	115.00	97.60	100.00
April	43.00	61.00	38.00	100.00	406.25	362.50	290.00	150.00	240.00	90.00	64.37	120.00	107.50	115.00	88.00	100.00
May	47.50	61.00	38.00	100.00	387.50	420.50	290.00	138.40	250.00	85.00	66.87	128.00	107.50	115.00	88.00	94.00
June	49.25	61.00	38.00	100.00	270.00	443.75	290.00	121.00	225.00	80.00	67.50	128.75	107.50	115.00	88.00	90.00
July	48.88	59.00	37.20	109.00	175.00	406.25	290.00	111.00	225.00	70.60	67.50	*119.50	106.50	115.00	88.00	90.00
Aug.	52.40	56.38	108.33	127.25	172.00	400.00	290.00	101.25	198.75	70.00	67.50	117.50	95.75	115.00	88.00	90.00
Sept.	59.63	56.00	90.00	117.00	169.75	387.50	285.00	98.75	170.00	65.80	75.63	*111.25	90.00	115.00	88.00	90.00
Oct.	67.80	50.10	70.40	105.00	162.25	310.00	285.00	105.00	170.00	63.00	100.00	*110.00	90.00	115.00	88.00	90.00
Nov.	73.75	50.00	68.00	105.00	160.80	256.00	285.00	112.50	170.00	61.50	100.00	*108.75	98.75	115.00	96.60	90.00
Dec.	75.00	47.00	72.20	106.00	169.75	243.75	275.00	122.50	135.00	60.00	100.00	*108.25	107.00	115.00	100.00	100.00
Average	*53.35*	*58.29*	*56.86*	*105.83*	*231.70*	*327.21*	*277.50*	*142.12*	*193.21*	*79.53*	*74.22*	*114.85*	*102.85*	*114.79*	*95.02*	*94.50*

*Price at furnace, where lower than price at seaboard.

Spiegeleisen (19 *to* 21 *Per Cent*), *Dollars a Gross Ton at Furnace*

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$25.00	$25.00	$30.38	$60.00	$60.00	$66.00	$51.40	$45.00	$26.00	$34.40	$38.00	$33.00	$32.00	$37.00
Feb.	25.00	25.00	36.25	68.75	61.25	60.75	58.75	40.00	38.00	35.50	38.00	33.00	32.00	37.00
March	25.00	25.00	57.00	75.00	71.25	47.00	60.00	35.00	29.40	40.00	38.00	33.00	32.00	37.00
April	25.00	25.00	65.00	75.00	80.75	45.00	67.60	34.00	32.25	45.00	36.80	33.00	32.00	37.00
May	25.00	25.00	65.00	81.00	84.00	37.40	75.00	32.00	35.00	52.50	36.00	33.00	32.00	36.24
June	25.00	25.00	61.00	82.50	89.00	31.25	75.00	32.00	36.00	48.50	35.00	32.80	32.00	35.50
July	25.00	25.00	52.50	85.00	89.00	35.00	75.00	27.00	36.00	44.00	34.20	32.00	32.00	33.50
Aug.	25.00	25.00	45.00	85.00	89.00	35.00	80.00	26.00	37.80	46.75	32.50	32.00	32.00	33.00
Sept.	25.00	26.60	45.00	82.50	83.75	35.00	82.00	26.00	38.25	43.75	31.40	31.80	32.00	33.00
Oct.	25.00	29.25	42.75	76.25	82.00	35.00	81.88	26.00	38.00	43.75	30.75	31.25	32.00	30.75
Nov.	25.00	29.25	45.40	66.00	80.25	37.00	75.62	26.00	37.50	41.25	30.25	32.00	37.40	30.00
Dec.	25.00	29.25	55.00	60.00	74.38	40.00	59.10	26.00	37.50	39.00	32.00	32.00	36.50	30.00
Average	*25.00*	*26.20*	*50.02*	*74.75*	*78.72*	*42.03*	*70.11*	*31.25*	*34.31*	*42.87*	*34.41*	*32.40*	*32.83*	*34.17*

50 Per Cent Ferrosilicon (Per Gross Ton, Delivered East of Mississippi)

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$80.00	$75.00	$54.00	$82.50	$75.00	$82.50	$85.00	$85.00
Feb.	85.00	93.00	55.00	83.75	75.00	82.50	85.00	85.00
March	85.00	92.40	55.00	90.00	75.00	82.50	85.00	85.00
April	85.00	86.25	55.00	92.50	75.00	82.50	85.00	85.00
May	80.00	76.40	55.00	94.50	75.00	82.50	85.00	85.00
June	80.00	69.75	55.00	90.00	75.00	82.50	85.00	85.00
July	80.00	66.00	55.00	82.50	71.00	82.50	85.00	85.00
Aug.	75.00	60.80	55.00	82.50	71.25	82.50	85.00	85.00
Sept.	75.00	60.00	55.00	82.50	72.00	82.50	85.00	85.00
Oct.	75.00	58.50	67.00	81.00	71.00	82.50	85.00	85.00
Nov.	75.00	55.80	75.00	80.63	70.00	82.50	85.00	85.00
Dec.	75.00	56.00	82.50	76.25	75.00	82.50	85.00	83.50
Ave.	*79.17*	*70.83*	*59.88*	*84.89*	*73.35*	*82.50*	*85.00*	*84.88*

Connellsville Coke Prices for Nineteen Years

Prompt Connellsville Furnace Coke, per Net Ton at Oven

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$1.59	$2.55	$1.40	$1.82	$3.88	$1.85	$1.50	$2.94	$9.50	$6.00	$5.65	$6.00	$5.06	$2.75	$8.05	$3.94	$3.94	$7.19	$3.50
February	1.59	2.12	1.45	1.78	2.52	1.85	1.50	3.38	9.62	6.00	4.44	6.00	4.50	3.04	7.13	4.08	3.63	7.31	3.38
March	1.60	2.00	1.55	2.12	2.40	1.90	1.50	3.47	9.60	6.00	4.06	6.00	4.35	3.25	7.25	4.08	3.35	3.05	3.35
April	1.60	1.77	1.59	2.39	2.15	1.86	1.50	2.41	7.38	6.00	3.65	9.60	3.50	4.48	6.31	3.75	3.04	3.00	3.20
May	1.57	1.66	1.50	2.28	2.13	1.77	1.50	2.30	7.80	6.00	3.69	12.00	3.25	6.00	5.15	3.25	3.00	2.91	2.94
June	1.52	1.65	1.42	2.02	2.11	1.75	1.56	2.49	11.25	6.00	4.00	15.00	3.00	6.75	4.75	3.19	2.77	2.83	2.93
July	1.53	1.59	1.44	2.21	2.45	1.75	1.64	2.75	12.75	6.00	4.07	17.20	2.81	10.75	4.55	3.00	2.83	2.84	3.00
August	1.66	1.57	1.46	2.21	2.50	1.70	1.50	2.80	13.60	6.00	4.31	17.75	2.75	12.80	4.56	3.00	3.06	2.95	3.00
September	2.39	1.60	1.50	2.37	2.29	1.65	1.61	2.94	11.12	6.00	4.56	16.70	3.15	11.13	4.50	3.00	3.49	3.38	2.85
October	2.76	1.59	1.50	3.41	2.98	1.60	2.03	4.88	6.00	6.00	4.52	15.12	3.28	9.60	3.85	3.00	6.13	3.63	2.85
November	2.74	1.50	1.52	3.94	1.82	1.52	2.28	6.90	6.00	6.00	5.87	8.26	3.03	7.19	3.81	3.04	5.75	4.43	2.77
December	2.67	1.44	1.60	4.00	1.75	1.50	2.64	8.38	6.00	6.00	6.12	6.20	2.75	7.00	4.00	3.68	4.32	3.50	2.75
Average	*1.94*	*1.75*	*1.49*	*2.55*	*2.42*	*1.73*	*1.73*	*3.80*	*9.22*	*6.00*	*4.58*	*11.32*	*3.45*	*7.06*	*5.33*	*3.42*	*3.78*	*3.92*	*3.04*

Prompt Connellsville Foundry Coke, per Net Ton at Oven

	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$2.00	$2.90	$1.90	$1.97	$4.40	$2.50	$2.00	$3.50	$9.75	$7.00	$6.25	$7.00	$6.38	$3.75	$8.70	$4.75	$4.88	$7.75	$4.50
February	1.95	2.70	2.10	2.09	3.25	2.50	2.00	3.50	11.00	7.00	5.00	7.00	5.63	4.00	8.25	4.88	4.31	8.31	4.31
March	1.95	2.60	2.05	2.56	3.00	2.45	2.00	3.75	11.60	7.00	4.94	7.00	5.45	4.25	8.38	4.88	4.15	4.40	4.40
April	1.86	2.45	2.00	2.69	3.00	2.40	2.00	3.56	9.13	7.00	4.30	10.20	4.75	5.06	7.56	4.75	4.00	4.06	4.06
May	1.85	2.20	1.81	2.58	2.85	2.40	2.00	3.25	8.90	7.00	4.31	13.00	4.50	6.30	6.15	4.69	4.00	4.00	4.00
June	1.80	2.17	1.76	2.40	2.80	2.32	2.00	3.25	11.72	7.00	4.56	15.75	4.45	7.25	5.56	4.38	3.80	4.00	4.00
July	2.00	2.15	1.82	2.40	2.70	2.22	2.05	3.25	13.25	7.00	5.00	17.80	4.06	11.00	5.35	4.10	3.75	4.00	4.00
August	1.95	2.15	1.85	2.40	2.90	2.25	2.00	3.30	13.20	7.00	5.25	18.88	3.75	13.90	5.38	4.00	3.88	4.00	4.00
September	2.55	2.12	1.85	2.54	2.90	2.10	2.07	3.31	11.75	7.00	5.80	17.70	4.15	12.50	5.50	4.00	4.25	4.38	4.00
October	2.90	2.10	1.81	3.65	2.81	2.00	2.35	3.88	6.00	7.00	6.25	16.38	4.38	11.70	4.80	4.00	6.31	4.63	4.00
November	3.25	2.05	1.85	4.25	2.60	1.92	2.88	7.10	7.00	7.00	7.00	9.50	4.19	8.38	4.81	4.06	6.81	5.50	3.85
December	3.20	1.97	1.90	4.50	2.50	1.90	2.95	8.63	7.00	7.00	7.00	7.00	3.81	7.88	4.81	4.55	5.20	4.50	3.75
Average	*2.27*	*2.30*	*1.89*	*2.84*	*2.98*	*2.25*	*2.19*	*4.19*	*10.03*	*7.00*	*5.47*	*12.27*	*4.63*	*8.00*	*6.27*	*4.42*	*4.61*	*4.96*	*4.11*

Heavy Melting Steel Scrap Composite Price

(Average of Pittsburgh, Chicago and Philadelphia Quotations, per Gross Ton)

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$11.77	$14.02	$10.29	$10.27	$16.46	$21.73	$29.93	$17.77	$25.13	$15.04	$12.45	$20.22	$19.15	$20.08	$16.97	$15.17
February	11.46	13.06	11.39	10.39	16.10	21.35	29.92	14.75	26.00	15.21	12.46	21.46	19.21	18.27	15.50	14.58
March	11.71	13.10	11.10	10.78	17.28	23.60	29.58	14.52	25.50	13.17	13.46	24.79	17.56	16.92	15.83	14.65
April	12.44	13.39	10.83	10.61	17.42	26.63	28.47	15.79	24.42	11.63	14.71	24.00	15.20	15.48	15.27	14.71
May	12.85	12.30	10.60	10.79	16.47	27.63	28.79	15.06	23.71	12.20	15.67	20.77	14.71	15.46	14.35	13.95
June	12.94	11.60	10.57	10.78	15.25	37.21	28.87	16.54	23.47	11.47	15.52	18.94	14.88	16.09	14.40	13.60
July	12.82	11.42	10.50	11.65	15.19	36.00	29.00	19.13	24.21	11.00	15.92	17.23	16.00	16.46	15.42	13.48
August	13.19	11.46	10.42	13.00	15.35	31.30	29.00	20.25	25.88	11.57	16.30	16.58	16.58	17.23	15.88	13.80
September	13.73	11.35	10.30	13.79	15.67	31.50	29.00	18.87	26.53	12.15	18.33	16.98	17.20	17.39	16.25	13.92
October	14.90	11.00	9.71	13.62	16.90	26.60	29.00	18.67	23.73	12.88	19.20	15.15	17.08	17.08	15.58	13.48
November	14.69	10.39	9.13	14.63	20.40	27.83	28.50	20.50	20.00	12.73	18.02	15.13	18.17	17.63	15.25	13.18
December	14.00	9.97	9.50	16.20	24.13	28.87	25.00	22.77	15.92	12.29	17.94	17.37	20.08	17.39	15.08	13.48
Average	*13.04*	*11.92*	*10.36*	*12.21*	*17.22*	*28.35*	*28.76*	*17.89*	*23.71*	*12.61*	*15.83*	*19.05*	*17.15*	*17.12*	*15.48*	*14.00*

Scrap Prices at Pittsburgh, per Gross Ton

Heavy Melting Steel

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	192^	1923	1924	1925	1926	1927
January	$12.75	$14.95	$10.90	$11.63	$17.50	$22.60	$30.00	$19.00	$26.30	$15.50	$14..0	$21.80	$21.38	$21.50	$18.63	$16.88
February	12.12	14.19	12.62	11.63	17.06	21.75	30.00	14.75	27.75	16.00	14.00	23.25	20.88	19.50	17.50	16.13
March	12.62	14.19	12.12	12.00	18.45	23.25	30.00	14.00	27.25	14.00	15.13	25.38	19.38	18.50	17.55	16.55
April	13.06	14.19	12.00	11.81	17.81	28.00	28.50	15.20	26.00	12.63	16.38	25.88	16.20	17.00	16.63	16.50
May	13.25	13.55	12.00	11.75	16.95	28.80	28.50	14.75	25.00	13.30	17.30	22.80	15.63	16.75	15.69	15.40
June	13.44	12.62	12.00	11.75	15.88	41.00	28.62	17.12	25.00	12.69	17.00	21.13	16.00	17.30	15.75	14.81
July	13.31	12.40	12.00	12.31	16.31	39.00	29.00	19.70	26.00	12.00	17.38	18.10	17.50	18.00	16.81	15.00
August	13.55	12.37	11.50	13.81	16.05	32.83	29.00	21.00	28.13	12.70	17.75	17.75	17.50	18.88	17.50	15.40
September	14.11	12.25	11.31	14.30	16.19	33.25	29.00	19.20	29.00	13.63	20.13	17.88	18.10	18.70	17.88	15.50
October	15.85	11.85	10.85	14.38	18.25	28.80	29.00	19.00	27.75	14.13	21.40	15.70	18.50	18.50	17.25	14.75
November	15.12	11.44	10.00	15.88	21.20	29.50	28.87	22.25	23.50	14.30	20.50	16.13	19.63	19.50	17.20	14.25
December	14.75	11.08	10.75	17.45	26.00	30.00	26.87	24.25	17.20	14.25	20.13	18.75	21.40	19.10	16.75	14.88
Average	*13.66*	*12.92*	*11.50*	*13.23*	*18.14*	*29.90*	*28.95*	*18.35*	*25.74*	*13.76*	*17.62*	*20.38*	*18.51*	*18.60*	*17.10*	*15.50*

No. 1 Cast Cupola Scrap

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$32.00	$25.00	$16.30	$23.30	$21.00	$19.63	$17.50	$16.00
Feb.	34.00	22.75	16.00	24.75	21.38	20.13	17.00	15.56
March	34.00	21.20	15.94	26.75	20.25	18.60	17.00	15.80
April	33.00	18.00	16.88	27.75	18.50	17.75	16.50	16.00
May	32.00	18.00	18.50	26.30	17.88	17.50	16.50	15.70
June	32.00	16.63	18.75	24.13	17.25	17.10	15.90	15.13
July	40.20	16.00	19.00	21.10	17.80	17.00	15.75	15.00
Aug.	41.25	16.20	19.00	21.38	18.00	17.50	16.80	15.00
Sept.	42.00	16.88	22.13	21.75	18.00	17.40	16.50	15.00
Oct.	39.75	17.50	24.00	19.50	18.00	17.39	16.00	14.75
Nov.	34.25	17.10	23.13	18.63	18.13	18.00	16.30	14.35
Dec.	27.25	16.13	22.38	20.00	19.10	17.70	16.00	14.38
Aver.	*35.14*	*18.45*	*19.33*	*22.95*	*18.77*	*17.98*	*16.48*	*15.22*

Compressed Sheets

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$23.00	$13.00	$11.80	$20.50	$18.88	$20.00	$17.63	$15.50
Feb.	23.75	13.00	12.00	21.75	19.63	18.00	16.13	15.06
March	23.00	12.00	13.13	23.75	17.50	17.35	15.60	15.45
April	22.13	10.50	14.63	24.75	14.60	15.63	15.25	15.56
May	22.00	10.80	15.10	24.30	13.75	15.46	14.75	14.40
June	22.00	10.13	15.13	19.88	14.38	16.30	14.60	13.75
July	21.50	9.38	15.50	16.90	15.70	16.63	15.50	14.31
Aug.	23.90	10.00	16.10	16.13	16.00	17.39	16.40	14.45
Sept.	24.25	10.06	17.88	16.00	16.55	17.40	16.50	14.50
Oct.	22.75	12.00	19.50	14.30	16.50	17.39	15.63	14.50
Nov.	19.80	12.00	19.50	14.25	17.75	18.00	16.00	13.70
Dec.	14.75	11.69	19.38	16.50	19.40	18.00	15.56	13.94
Ave.	*21.90*	*11.22*	*15.80*	*19.08*	*16.72*	*17.27*	*15.80*	*14.59*

Machine Shop Turnings

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$15.50	$10.00	$9.60	$16.90	$15.75	$17.50	$14.30	$12.00
Feb.	17.88	10.00	9.56	18.50	16.13	15.88	13.63	11.38
March	18.00	9.40	10.50	20.38	14.50	14.20	13.35	12.00
April	16.70	8.13	11.88	20.50	12.45	13.39	12.00	12.63
May	15.38	8.70	13.30	19.20	11.88	12.25	11.00	11.30
June	14.75	7.56	13.32	17.19	13.00	13.05	11.00	10.50
July	13.40	7.00	14.00	12.10	13.50	13.63	11.38	11.50
Aug.	15.25	7.85	14.00	11.44	14.13	15.00	12.80	11.80
Sept.	16.30	9.06	14.75	12.88	14.40	14.75	13.06	11.63
Oct.	15.88	9.56	16.20	11.60	14.25	14.39	12.06	11.50
Nov.	14.63	9.85	16.63	11.63	15.94	15.00	11.90	11.10
Dec.	10.50	8.88	15.63	13.75	17.20	14.30	11.56	11.00
Aver.	*15.35*	*8.83*	*13.28*	*15.51*	*14.43*	*14.44*	*12.34*	*11.53*

Cast Iron Borings

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$18.70	$13.00	$10.90	$18.40	$16.94	$17.50	$14.88	$12.50
Feb.	20.25	12.00	11.06	19.50	16.88	15.88	14.13	12.13
March	19.50	11.45	11.94	21.13	15.38	14.10	13.30	12.50
April	18.60	9.38	13.38	21.88	13.00	13.39	12.50	12.38
May	17.38	9.70	14.10	20.20	12.75	12.50	11.75	11.10
June	16.75	8.38	14.63	17.88	14.00	13.05	11.90	10.50
July	18.00	7.63	16.00	15.20	13.80	13.63	12.38	10.63
Aug.	19.63	8.30	15.70	13.88	14.75	15.00	12.75	11.00
Sept.	20.20	9.00	17.00	15.63	14.90	14.75	12.94	11.00
Oct.	19.00	10.13	18.60	13.50	15.00	14.39	12.50	11.00
Nov.	17.38	10.40	17.85	12.75	15.13	15.00	12.90	11.00
Dec.	14.00	9.25	17.50	14.88	16.70	14.90	12.13	11.00
Aver.	*18.28*	*9.88*	*14.89*	*17.07*	*14.94*	*14.51*	*12.84*	*11.56*

Low-Phosphorus Scrap, at Pittsburgh; Billet and Bloom Crops; Per Gross Ton

	1920	1921	1922	1923	1924	1925	1926	1927
Jan.	$30.80	$24.00	$17.60	$25.30	$23.60	$26.50	$24.00	$21.00
Feb.	31.75	23.75	17.13	27.50	25.13	24.75	22.25	20.25
March	31.00	21.60	17.38	32.00	24.00	23.30	22.00	20.30
April	30.25	18.63	18.88	32.25	19.40	22.13	21.13	21.00
May	30.00	18.10	20.00	28.60	19.50	21.63	20.00	20.00
June	30.00	16.88	20.00	25.88	20.13	22.00	20.00	19.25
July	31.25	15.88	20.13	22.00	20.90	22.00	20.75	19.00
Aug.	33.40	16.50	21.20	23.50	21.88	22.25	21.00	19.00
Sept.	34.25	17.25	24.25	24.38	22.60	23.00	21.67	20.00
Oct.	33.00	17.50	25.00	21.90	23.00	23.13	20.50	19.25
Nov.	30.00	17.30	24.00	20.50	23.25	24.00	20.60	18.30
Dec.	25.25	17.00	24.00	21.75	25.13	24.00	21.13	18.50
Ave.	*30.91*	*18.70*	*20.80*	*25.46*	*22.39*	*23.22*	*21.25*	*19.65*

No. 1 Railroad Cast Scrap at Cincinnati

(Per Net Ton)

	1921	1922	1923	1924	1925	1926	1927
January	$16.25	$12.00	$17.20	$17.25	$17.38	$15.75	$14.00
February	15.50	11.63	19.50	17.75	15.88	15.00	13.00
March	13.90	12.00	21.75	16.25	15.50	14.50	13.00
April	13.50	13.25	22.00	14.00	15.13	14.10	13.00
May	13.50	14.00	20.60	13.00	15.00	13.50	13.00
June	12.75	14.00	18.00	13.38	15.90	13.63	13.00
July	11.00	14.00	16.70	14.50	16.00	14.50	13.00
August	11.00	14.40	16.25	14.50	15.63	14.75	13.00
September	12.00	16.13	16.88	15.30	15.50	15.00	13.00
October	12.50	18.00	14.50	14.88	15.00	14.39	12.50
November	12.50	17.13	13.66	15.63	15.88	14.00	12.25
December	12.00	16.63	15.00	16.38	16.00	14.00	12.00
Average	*13.03*	*14.43*	*17.67*	*15.23*	*15.73*	*14.42*	*12.90*

No. 1 Machinery Cast Scrap at Cincinnati

(Per Net Ton)

	1921	1922	1923	1924	1925	1926	1927
January	$17.75	$14.00	$20.39	$20.50	$20.12	$19.75	$17.00
February	15.50	13.63	21.75	21.50	19.12	19.39	16.00
March	13.90	14.05	23.65	20.00	18.35	19.00	16.00
April	13.50	15.50	24.75	18.00	17.75	17.80	16.00
May	13.50	16.25	24.05	16.75	17.75	17.00	15.60
June	13.10	16.25	22.13	17.13	18.15	17.00	15.50
July	12.00	16.25	20.25	18.25	18.25	17.00	15.50
August	12.00	17.45	19.05	18.25	19.00	17.63	15.50
September	12.80	19.88	19.38	18.13	19.25	18.00	15.50
October	14.00	21.25	18.00	17.68	19.00	17.39	15.50
November	14.00	20.85	16.85	18.40	20.12	17.00	14.50
December	14.00	20.75	18.00	18.75	20.00	17.00	14.00
Average	*13.84*	*17.17*	*20.69*	*18.69*	*18.91*	*17.83*	*15.55*

Scrap Prices at Chicago, 1911 to 1926

Heavy Melting Steel Scrap, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$10.75	$12.60	$9.35	$9.19	$15.50	$21.12	$30.00	$17.40	$24.50	$15.13	$11.45	$19.15	$17.69	$19.44	$15.12	$13.25
February	10.75	12.13	10.50	9.56	14.75	21.50	30.25	15.06	25.00	15.13	11.38	20.33	17.88	17.69	13.88	13.00
March	10.94	12.08	9.81	9.63	16.50	23.70	29.87	15.63	24.25	12.50	12.38	23.50	16.56	16.45	13.95	12.90
April	11.56	12.50	9.80	9.15	16.50	27.00	28.75	16.41	23.75	11.00	13.75	22.50	14.10	14.81	13.19	13.13
May	12.05	11.25	9.69	9.37	15.94	28.70	28.80	15.62	23.00	11.50	14.95	19.70	13.75	15.00	12.13	12.35
June	12.12	10.44	9.75	9.44	14.80	36.50	29.00	16.69	22.95	10.81	14.56	17.88	13.63	15.75	12.45	12.00
July	11.69	10.50	9.75	10.40	14.50	33.00	29.00	19.40	24.13	10.00	15.25	17.05	14.90	15.60	14.19	12.06
August	12.25	10.56	9.69	11.56	15.25	29.60	29.00	20.88	25.35	10.60	15.95	16.00	15.50	16.44	14.00	12.30
September	12.81	10.06	9.19	11.75	16.06	31.25	29.00	19.10	24.81	11.31	18.13	16.31	16.40	16.35	14.00	12.25
October	13.95	10.00	8.50	11.75	16.81	26.00	29.00	18.25	21.50	12.44	18.40	14.15	16.13	16.00	13.00	11.69
November	13.69	9.56	8.06	13.44	20.60	27.60	28.50	20.88	18.45	12.25	17.31	14.00	17.13	16.00	13.00	11.50
December	12.88	9.00	8.43	15.63	23.00	28.37	22.75	21.80	16.20	11.13	17.25	16.06	18.95	15.75	13.00	12.06
Average	*12.12*	*10.89*	*9.38*	*10.91*	*16.68*	*27.86*	*28.66*	*18.09*	*22.82*	*11.98*	*15.06*	*18.05*	*16.05*	*16.27*	*13.49*	*12.39*

Old Steel Rerolling Rails, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.00	$16.15	$11.10	$9.62	$17.06	$27.00	$35.00	$22.10	$34.25	$15.63	$12.10	$20.40	$18.88	$21.75	$17.50	$16.38
February	12.80	15.50	11.81	9.87	17.06	27.00	35.00	16.44	34.38	15.50	12.00	21.75	20.13	19.25	16.63	15.94
March	12.75	15.00	11.56	10.25	17.65	28.00	34.75	16.38	32.30	13.30	13.31	24.63	19.13	17.86	16.50	15.60
April	12.88	14.63	11.50	10.25	18.00	32.62	33.50	17.55	32.13	12.63	14.50	23.75	16.30	16.00	16.13	16.00
May	13.50	13.95	11.31	10.25	17.38	36.50	34.00	17.75	31.75	13.40	15.70	21.70	15.00	16.88	15.19	15.20
June	13.50	12.69	11.50	10.25	15.85	46.90	34.00	18.75	32.65	12.94	15.25	19.25	14.81	17.85	15.45	14.75
July	13.50	12.25	11.50	10.30	15.25	45.19	34.00	25.15	35.00	12.25	16.13	18.00	15.50	17.44	17.19	14.88
August	14.00	12.12	11.50	12.25	15.80	39.20	34.00	29.50	38.00	12.45	16.90	17.50	16.19	19.00	17.10	15.30
September	15.00	12.25	10.75	13.35	17.06	39.75	34.00	26.80	38.13	13.13	19.38	17.38	17.30	19.25	17.39	15.19
October	16.30	12.15	10.00	13.31	18.81	34.75	34.00	27.19	33.44	14.00	20.30	15.80	17.06	18.88	16.63	14.88
November	16.50	12.00	9.50	14.44	24.50	34.80	33.50	31.25	22.90	13.80	18.38	15.06	18.19	19.44	16.50	14.50
December	16.50	11.33	9.50	16.63	28.63	35.25	27.50	31.90	16.90	12.63	17.75	17.00	20.36	19.10	16.19	14.63
Average	*14.19*	*13.34*	*10.96*	*11.73*	*18.59*	*35.58*	*33.60*	*23.40*	*31.90*	*13.47*	*15.98*	*19.35*	*17.40*	*18.56*	*16.53*	*15.27*

No. 1 Railroad Wrought, per Net Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$11.63	$12.70	$8.70	$8.69	$15.88	$23.50	$31.25	$19.10	$26.00	$13.63	$10.50	$17.75	$15.31	$17.44	$13.50	$12.50
February	11.30	12.19	9.50	8.87	14.94	23.75	31.25	15.13	27.00	13.50	10.44	18.38	15.38	16.13	12.88	12.31
March	11.44	12.13	9.06	9.00	16.20	25.90	30.75	15.88	27.10	11.60	11.50	20.88	14.06	14.60	12.95	12.10
April	12.31	12.38	9.00	8.65	17.00	30.35	30.20	16.05	27.25	10.00	12.13	20.00	12.75	13.00	12.44	12.39
May	12.75	11.25	9.00	8.94	16.50	32.60	29.75	15.69	26.38	10.40	12.90	17.60	12.00	13.44	10.94	11.35
June	12.57	10.56	9.00	9.00	15.20	41.00	29.75	16.87	25.25	9.63	12.69	15.50	11.56	14.65	11.60	11.00
July	12.06	10.55	9.00	9.15	14.94	37.75	29.75	18.60	24.88	9.25	13.63	14.60	12.80	14.19	13.31	11.39
August	12.50	10.62	8.94	10.44	15.30	33.70	29.75	20.75	24.75	10.45	14.75	14.25	13.75	16.00	13.50	11.70
September	13.13	10.19	8.37	11.00	16.38	35.50	29.75	19.50	23.88	11.50	17.62	15.63	14.80	15.50	13.50	11.25
October	14.25	9.60	7.87	11.19	17.50	28.75	30.36	19.38	20.25	13.00	17.75	13.20	14.25	14.38	12.81	10.19
November	13.50	9.00	7.56	12.94	21.00	30.90	28.68	22.88	16.85	12.20	15.81	12.50	15.50	15.63	12.50	9.60
December	13.06	8.50	7.90	15.38	25.13	31.25	24.62	24.10	14.60	10.44	15.13	15.00	16.81	13.95	12.00	10.44
Average	*12.54*	*10.81*	*8.66*	*10.27*	*17.16*	*31.25*	*29.66*	*18.66*	*23.68*	*11.30*	*13.74*	*16.27*	*14.08*	*14.91*	*12.66*	*11.35*

No. 1 Machinery Cast Scrap, per Net Ton

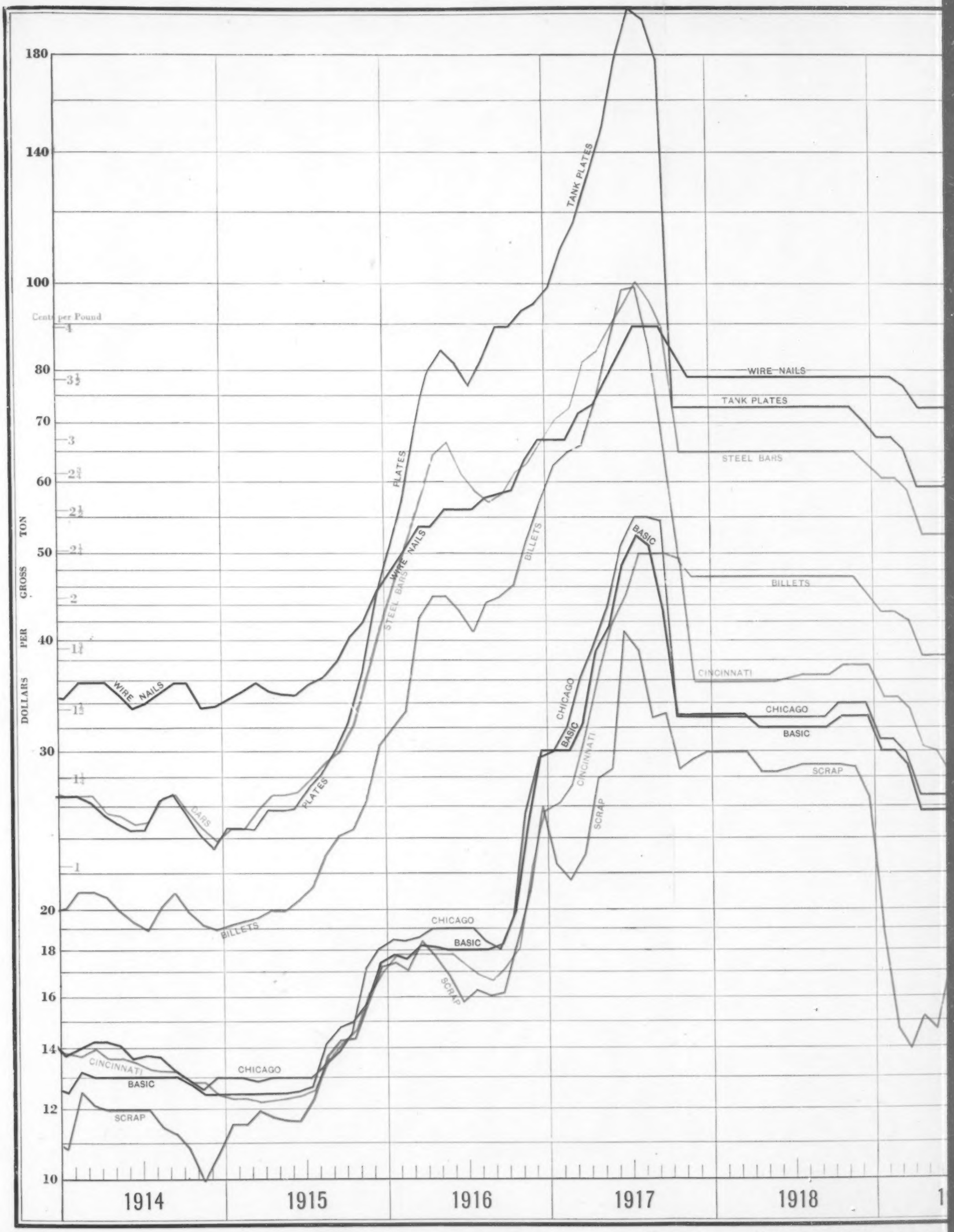
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$11.25	$12.90	$10.20	$9.19	$13.31	$15.50	$25.90	$22.95	$37.25	$17.25	$12.90	$21.60	$20.38	$19.88	$17.00	$16.50
February	11.25	12.69	10.87	9.00	12.81	15.37	26.06	20.00	38.88	18.00	13.25	23.63	21.00	18.75	17.00	16.50
March	11.31	12.50	10.37	9.00	13.45	16.90	27.25	21.63	37.85	14.90	14.13	26.25	20.13	18.20	17.00	16.50
April	12.06	12.44	10.25	9.00	12.88	20.43	27.12	21.45	37.25	13.25	14.88	25.75	18.40	17.25	16.39	16.50
May	12.20	11.60	10.06	9.00	12.56	23.20	26.70	20.12	37.38	13.60	16.20	23.30	17.38	16.88	15.88	15.80
June	11.81	10.63	9.75	9.00	11.75	30.00	27.12	20.75	36.30	12.75	16.06	21.75	16.75	17.50	16.15	14.50
July	11.75	10.70	9.65	9.25	11.50	29.25	28.06	23.30	36.50	12.25	17.00	19.60	16.90	17.50	17.19	14.50
August	12.15	10.87	9.50	9.62	11.50	24.20	29.10	24.50	36.20	12.60	18.60	18.00	17.50	17.63	17.00	14.80
September	12.81	10.62	9.19	10.10	12.13	23.75	30.00	24.20	34.00	13.44	21.38	19.63	18.20	17.90	16.88	14.56
October	14.20	10.40	9.00	10.50	13.50	20.50	30.36	25.00	28.75	13.88	20.80	18.70	17.50	17.63	16.50	14.25
November	13.50	10.06	8.56	12.13	15.55	22.00	28.87	28.12	23.00	13.50	20.25	18.38	17.88	18.19	16.00	13.50
December	13.25	9.83	9.00	13.75	16.25	23.50	25.75	32.35	18.70	12.63	19.75	19.75	19.20	17.25	16.13	14.00
Average	*12.30*	*11.27*	*9.70*	*9.96*	*13.10*	*22.05*	*27.69*	*23.70*	*33.51*	*14.00*	*17.10*	*21.36*	*18.44*	*17.88*	*16.59*	*15.16*

Cast Borings, per Gross Ton

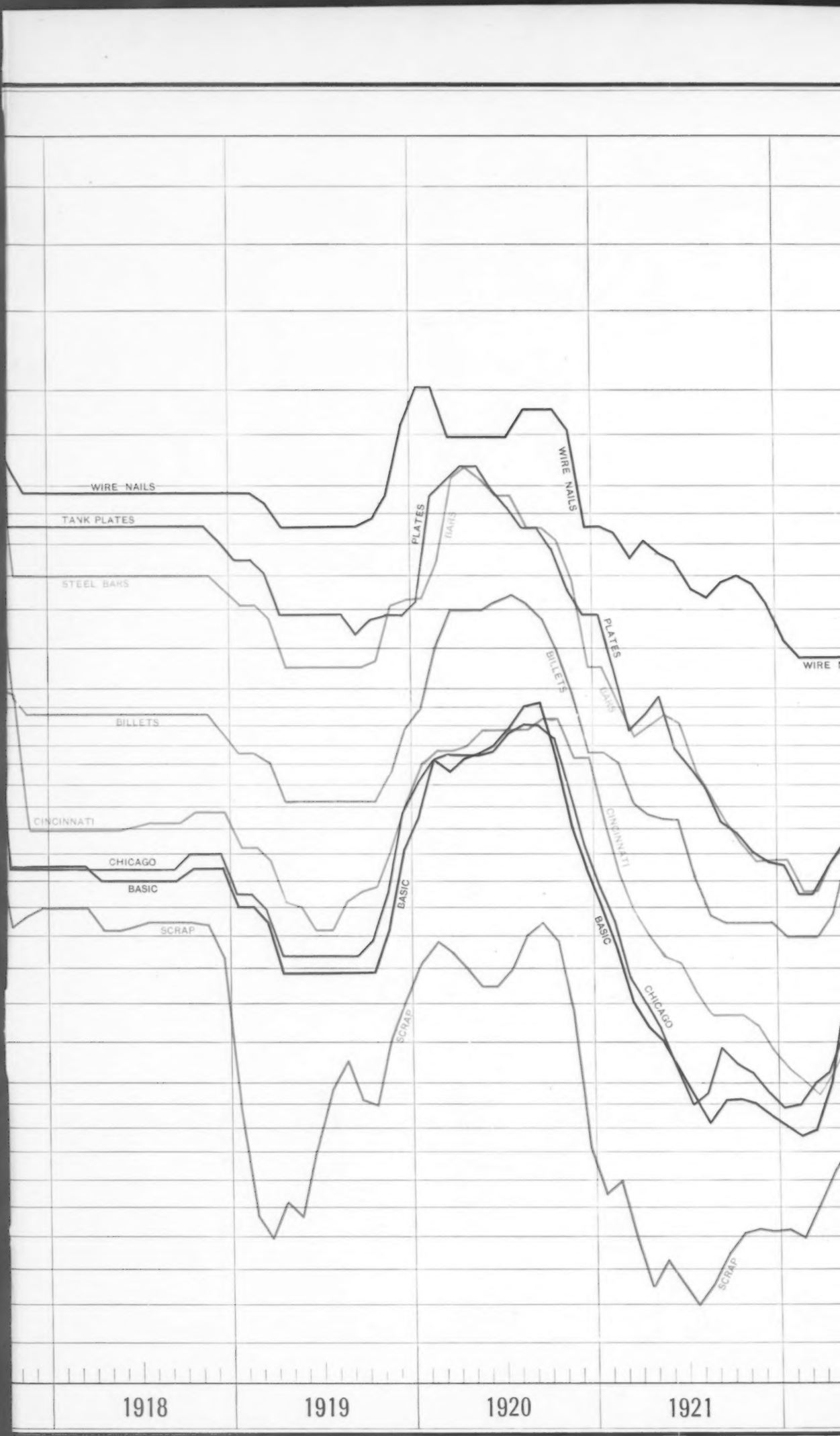
	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$10.08	$18.48	$12.54	$16.11	$10.92	$6.38	$15.57	$13.58	$15.56	$13.39	$10.06
February	10.15	18.48	8.75	16.39	11.76	6.93	16.59	15.55	14.63	12.06	10.13
March	10.64	18.48	10.15	15.74	8.40	8.05	18.91	14.38	13.85	11.75	10.20
April	11.83	17.99	10.47	15.96	7.28	9.24	17.92	11.40	10.94	10.94	10.44
May	13.44	17.53	9.31	14.43	6.61	10.98	16.24	10.00	10.00	9.75	10.00
June	19.60	17.77	9.33	13.38	5.60	11.63	14.43	10.06	10.70	9.95	9.56
July	20.01	18.48	12.71	14.15	5.32	12.67	13.66	10.45	11.13	11.19	9.94
August	18.36	18.48	14.28	15.06	5.38	12.88	12.04	10.69	12.75	11.45	10.50
September	18.20	18.48	13.55	14.65	5.60	14.43	12.19	11.80	13.15	11.19	10.75
October	15.75	18.48	11.63	12.88	6.44	14.90	10.42	11.56	12.75	8.88	10.13
November	17.25	16.80	12.88	11.93	6.83	14.56	10.08	12.63	13.19	9.20	9.60
December	18.05	14.84	14.17	10.98	6.09	14.56	12.04	14.36	13.50	9.50	10.19
Average	*15.28*	*17.94*	*11.65*	*14.30*	*7.19*	*11.43*	*14.17*	*12.21*	*12.68*	*10.77*	*10.13*

Steel Knuckles and Couplers, per Gross Ton

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$25.20	$37.52	$24.51	$27.44	$16.39	$12.77	$24.98	$21.21	$22.88	$18.00	$16.25
February	25.20	36.89	19.32	29.68	16.11	12.39	26.53	21.77	21.00	17.13	16.00
March	26.60	35.00	19.60	27.66	13.55	14.12	28.71	20.00	18.70	16.70	15.60
April	30.67	34.00	19.21	26.32	12.47	15.68	27.93	17.40	17.63	16.44	15.69
May	33.71	34.00	17.36	25.48	13.66	16.69	25.42	17.00	17.63	15.39	14.80
June	43.83	34.00	18.20	25.20	13.16	15.89	22.55	16.63	19.00	15.30	14.25
July	45.92	34.00	20.50	27.16	11.63	17.92	21.00	17.20	18.19	17.39	14.25
August	44.24	34.00	23.52	29.01	12.21	19.21	20.87	18.00	19.50	17.50	14.40
September	40.88	34.00	21.95	27.72	13.03	21.84	21.56	19.35	19.50	17.39	14.00
October	33.38	34.00	21.43	24.51	14.84	22.96	18.93	18.25	18.63	16.06	13.25
November	33.04	34.00	23.39	20.83	14.28	21.84	17.64	19.63	18.75	15.50	13.00
December	35.67	32.55	24.86	16.95	12.60	22.12	19.88	22.78	18.25	15.50	13.69
Average	*34.86*	*34.50*	*21.15*	*25.67*	*13.66*	*17.79*	*23.00*	*19.10*	*19.14*	*16.53*	*14.60*



Fourteen Years of Prices o



urteen Years of Prices of Pig Iron, Finished and Semi-Finished S

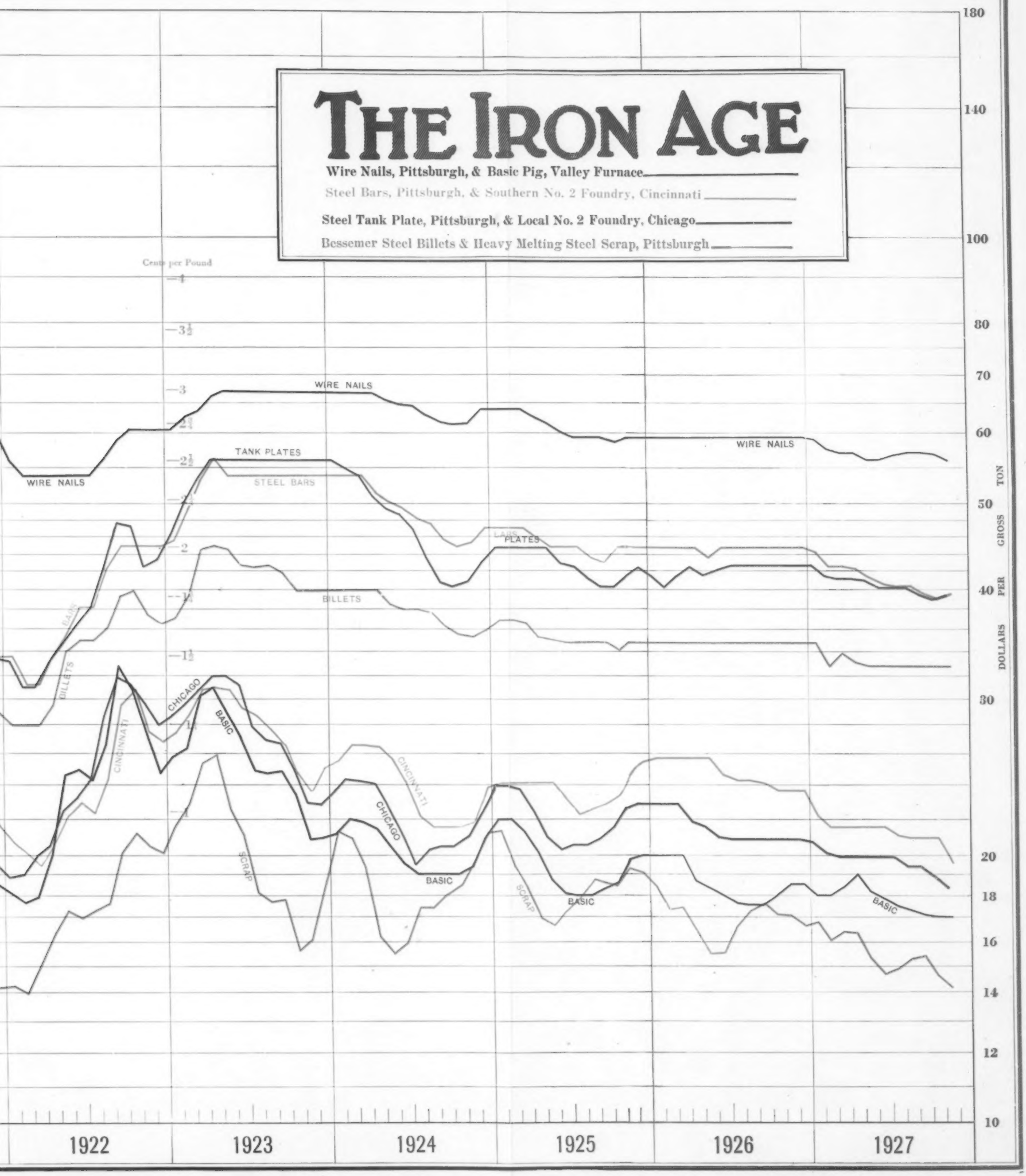
THE IRON AGE

Wire Nails, Pittsburgh, & Basic Pig, Valley Furnace

Steel Bars, Pittsburgh, & Southern No. 2 Foundry, Cincinnati

Steel Tank Plate, Pittsburgh, & Local No. 2 Foundry, Chicago

Bessemer Steel Billets & Heavy Melting Steel Scrap, Pittsburgh



hed Steel and Heavy Melting Scrap

Railroad Malleable Scrap at Chicago, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$12.19	$15.01	$10.36	$9.11	$15.47	$19.88	$30.02	$19.71	$32.48	$16.52	$12.77	$25.26	$20.93	$21.13	$18.00	$16.06
February	11.54	14.56	11.63	8.96	14.93	19.39	30.02	16.65	33.53	17.36	12.81	26.75	21.77	20.00	17.56	16.06
March	11.69	14.56	10.71	8.89	15.62	20.10	31.24	18.07	31.92	15.46	13.87	28.56	21.00	19.10	17.60	16.00
April	12.53	14.77	10.25	8.96	15.56	22.81	31.64	17.70	30.95	13.59	15.68	28.00	19.30	17.50	17.39	15.88
May	12.94	13.55	10.24	9.12	15.05	26.10	32.82	17.08	29.68	14.11	16.80	25.54	18.13	17.63	16.50	14.45
June	13.16	12.39	10.08	9.11	13.14	35.41	33.04	17.92	28.73	12.88	16.73	24.08	16.88	18.00	16.60	13.50
July	13.16	11.87	10.08	9.97	13.03	33.73	33.28	20.94	30.24	12.53	17.51	22.51	17.00	17.88	17.81	13.63
August	13.50	11.63	9.95	11.20	12.60	33.26	34.01	22.96	32.20	13.44	19.04	20.59	17.38	19.13	17.75	14.50
September	14.07	11.41	9.24	11.48	12.88	34.44	34.01	21.22	30.95	14.63	23.67	21.71	18.20	19.10	17.39	13.69
October	15.40	10.81	8.85	11.48	13.87	28.28	34.01	21.35	26.32	15.12	24.42	19.60	18.13	18.50	16.50	13.13
November	15.19	10.43	8.68	12.75	17.92	28.67	32.68	25.89	21.78	14.67	23.11	18.91	19.00	19.19	16.50	12.55
December	15.12	10.08	8.90	15.40	20.16	30.63	25.48	28.78	16.80	12.81	22.40	20.23	20.28	18.30	16.00	12.81
Average	*13.37*	*12.59*	*9.91*	*10.53*	*15.02*	*27.72*	*31.85*	*20.85*	*28.80*	*14.43*	*18.23*	*23.48*	*19.00*	*18.79*	*17.13*	*14.36*

Old Cast Iron Carwheels at Chicago, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.25	$16.95	$11.65	$9.94	$14.63	$18.87	$30.00	$25.90	$36.13	$21.00	$15.30	$26.70	$20.50	$21.38	$18.00	$15.31
February	13.05	16.75	12.44	10.00	13.94	18.25	30.00	22.75	38.06	20.63	15.00	27.25	21.00	19.38	17.13	15.13
March	13.00	16.75	11.88	9.94	14.30	20.25	30.00	21.50	36.20	15.90	16.50	28.38	21.00	17.10	17.00	15.00
April	13.25	16.75	11.55	9.75	13.88	23.62	29.00	21.50	37.50	14.06	18.63	27.75	16.70	16.00	16.39	15.00
May	13.90	15.05	11.50	9.75	12.95	27.35	29.00	21.25	37.50	14.70	18.50	24.10	16.25	16.06	15.25	14.05
June	14.13	13.94	11.50	10.19	12.44	39.00	29.00	22.00	35.90	13.31	18.25	21.88	15.63	17.30	15.30	13.50
July	13.88	12.90	11.25	11.30	12.50	35.25	29.00	23.95	35.75	12.75	19.25	20.60	16.40	17.12	16.39	13.75
August	13.70	12.75	11.25	11.04	11.60	30.40	29.00	26.25	38.35	12.95	20.60	19.50	17.13	17.50	15.90	14.50
September	14.38	12.63	11.06	11.80	11.69	31.87	29.00	24.90	37.69	14.19	23.75	19.75	18.20	17.70	15.25	14.25
October	16.00	12.10	10.65	12.00	12.94	25.75	29.00	24.88	36.06	16.50	25.10	17.90	17.63	17.38	14.50	13.56
November	16.69	12.00	9.81	13.31	17.30	28.15	29.00	28.63	31.95	16.60	24.63	17.88	18.63	18.31	14.50	13.25
December	16.75	11.88	9.60	14.56	21.25	31.00	26.75	31.10	24.40	15.75	24.00	19.75	20.70	18.30	14.50	13.44
Average	*14.33*	*14.20*	*11.18*	*11.13*	*14.12*	*27.48*	*29.06*	*24.55*	*35.46*	*15.70*	*19.96*	*22.62*	*18.31*	*17.79*	*15.84*	*14.23*

Philadelphia Scrap Prices, 1912 to 1927, Delivered Eastern Pennsylvania

Heavy Melting Steel Scrap, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$12.19	$14.40	$10.40	$10.00	$16.38	$21.70	$30.00	$17.20	$24.75	$14.50	$11.60	$19.70	$18.20	$18.50	$17.00	$15.39
February	11.70	12.87	11.00	10.00	16.50	20.63	30.00	14.75	25.62	14.25	12.00	20.75	18.38	17.63	15.88	14.62
March	11.80	13.25	11.31	10.80	16.90	23.50	29.00	14.19	25.20	13.00	12.78	25.25	16.75	15.90	16.00	14.50
April	12.94	13.34	10.95	11.00	17.88	24.88	28.00	15.50	24.12	11.25	14.00	23.63	15.30	14.63	16.00	14.50
May	13.50	12.10	10.63	11.25	16.60	25.40	29.00	15.00	23.37	11.80	14.75	19.80	14.75	14.63	15.25	14.10
June	13.50	11.75	10.50	11.10	15.31	34.13	29.00	16.12	22.60	11.25	15.00	17.88	15.00	15.10	14.70	14.00
July	13.50	11.35	10.30	12.06	14.94	35.20	29.00	18.90	22.62	11.00	15.00	16.60	15.40	15.63	14.63	13.39
August	13.65	11.43	10.19	13.75	14.75	31.88	29.00	19.37	25.00	11.40	15.20	16.00	16.75	16.38	16.20	13.70
September	14.50	11.62	10.69	15.00	14.75	30.25	29.00	18.62	25.62	11.50	16.88	16.75	17.10	17.20	16.38	14.00
October	15.10	11.15	9.95	14.75	15.63	25.00	29.00	19.10	22.75	12.06	17.80	15.40	16.63	16.75	16.50	14.00
November	15.50	10.19	9.25	14.65	20.13	26.00	28.00	20.62	19.00	11.88	16.25	15.25	17.75	17.38	15.50	13.80
December	15.25	10.00	9.40	15.81	23.75	28.20	25.00	22.50	15.25	11.50	16.38	16.75	20.10	17.50	15.50	13.50
Average	*13.69*	*11.96*	*10.38*	*12.51*	*16.96*	*27.23*	*28.67*	*17.66*	*22.99*	*12.12*	*14.80*	*18.65*	*16.84*	*16.44*	*15.84*	*14.13*

No. 1 Machinery Cast Scrap, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$13.42	$14.50	$12.00	$12.00	$17.00	$20.20	$30.00	$23.80	$36.00	$23.25	$16.50	$23.20	$20.70	$20.13	$18.39	$17.00
February	13.00	14.37	12.88	12.00	17.00	20.00	30.00	23.00	40.00	23.00	16.50	24.25	20.25	18.88	17.75	17.00
March	13.12	14.00	13.00	12.00	17.00	21.75	30.00	21.25	39.20	19.40	17.13	28.25	18.63	18.00	17.50	17.00
April	13.62	13.94	13.00	11.75	17.88	26.63	29.00	22.00	38.00	18.00	17.25	26.25	17.70	17.25	17.50	17.00
May	13.75	13.60	12.25	12.13	17.50	29.00	29.00	21.50	37.75	18.00	18.40	24.30	17.00	17.00	17.25	16.80
June	13.75	13.25	12.00	12.25	16.50	33.50	29.00	22.00	37.00	17.38	19.00	22.25	17.50	17.50	17.00	16.00
July	13.75	13.00	12.00	12.38	16.00	36.30	29.00	22.10	37.50	16.50	17.50	20.40	17.50	17.63	17.00	16.00
August	13.75	12.87	12.00	13.30	16.00	33.25	29.00	24.75	39.00	17.00	18.60	20.38	17.88	18.00	17.70	16.00
September	14.96	12.81	12.00	14.00	16.00	31.00	29.00	25.00	39.25	17.00	21.50	21.38	18.00	18.00	18.00	16.38
October	14.50	13.50	11.40	14.00	16.15	28.00	29.00	25.20	38.75	17.13	22.60	19.50	17.50	18.00	17.39	16.50
November	14.75	12.62	11.00	14.50	18.50	30.00	29.00	27.62	33.80	17.50	21.00	19.25	17.88	18.00	17.30	16.13
December	15.00	12.17	11.30	16.06	20.75	30.60	29.00	30.75	24.50	16.63	20.25	20.25	19.50	18.13	17.00	16.00
Average	*13.95*	*13.39*	*12.07*	*13.03*	*17.19*	*28.35*	*29.25*	*24.08*	*36.73*	*18.49*	*18.85*	*22.47*	*18.34*	*18.04*	*17.48*	*16.48*

No. 1 Railroad Wrought, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$15.37	$16.10	$13.05	$12.00	$22.00	$26.60	$35.00	$24.20	$33.50	$20.00	$14.50	$22.10	$20.90	$20.88	$18.39	$17.00
February	14.00	15.12	14.38	12.00	21.63	25.50	35.00	21.50	36.00	19.75	14.63	24.75	21.50	20.13	17.75	17.00
March	14.12	15.25	14.00	12.50	22.13	30.75	35.00	20.25	35.90	17.20	15.38	27.50	19.00	18.90	17.20	17.00
April	15.44	15.37	13.25	12.69	23.38	36.00	35.00	21.60	35.00	17.00	15.88	27.00	18.10	17.75	17.50	16.50
May	15.75	15.00	12.63	12.94	22.50	41.40	34.00	21.00	33.50	15.20	16.90	24.20	16.63	17.50	17.25	16.50
June	15.44	14.75	12.50	13.00	20.50	51.25	34.00	21.50	33.00	14.38	17.00	22.50	16.50	18.10	16.60	16.00
July	15.50	13.90	12.20	13.44	19.50	50.60	34.00	24.40	33.00	13.50	17.13	18.80	17.70	17.63	16.50	15.75
August	15.80	14.00	12.00	14.95	20.20	45.00	34.00	26.50	33.00	14.00	18.00	18.00	18.63	17.50	17.80	15.50
September	16.31	14.68	12.38	16.50	20.00	44.00	34.00	26.50	33.25	15.00	20.88	18.50	19.00	17.70	17.88	15.50
October	16.80	14.00	11.80	16.13	21.63	37.20	34.00	26.90	29.25	15.88	22.20	17.50	18.00	18.13	17.00	15.50
November	17.06	13.00	11.50	16.50	24.13	35.00	34.00	28.37	25.00	16.00	19.00	17.38	18.38	18.50	17.00	15.30
December	16.25	12.75	11.50	20.06	26.75	35.00	33.00	30.25	20.00	14.63	19.25	18.50	20.40	18.50	17.00	15.25
Average	*15.65*	*14.49*	*12.60*	*14.39*	*22.03*	*38.19*	*34.25*	*24.41*	*31.70*	*16.04*	*17.56*	*21.39*	*18.73*	*18.44*	*17.32*	*16.07*

Old Cast Iron Carwheels, per Gross Ton

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$12.37	$16.20	$12.20	$11.00	$16.38	$21.50	$30.00	$24.60	$36.00	$25.00	$16.50	$22.30	$20.10	$19.50	$18.13	$16.38
February	12.00	15.37	12.63	10.63	16.50	20.50	30.00	23.00	40.62	24.00	15.00	24.75	20.38	18.38	17.50	16.00
March	11.94	15.00	12.50	11.00	16.70	21.50	30.00	23.00	42.40	18.50	15.94	26.50	18.75	18.50	17.50	16.00
April	12.87	14.87	12.00	11.00	17.38	25.75	29.00	23.10	40.00	18.00	15.88	26.50	17.50	17.75	17.50	16.00
May	13.90	13.75	11.75	11.38	16.70	28.00	29.00	21.00	40.00	16.80	16.70	24.20	17.00	17.00	17.25	16.00
June	14.00	13.12	11.19	11.55	16.38	34.00	29.00	22.00	38.00	18.00	17.13	22.75	17.00	17.00	17.00	15.38
July	14.00	12.30	11.00	12.38	15.63	36.20	29.00	23.20	38.50	16.50	17.50	20.40	17.30	17.25	17.00	15.00
August	14.05	12.37	11.25	13.25	15.50	34.50	29.00	24.50	40.60	16.40	18.10	20.25	17.75	18.50	17.40	15.30
September	14.25	12.75	11.25	14.00	15.50	32.50	29.00	24.50	42.75	17.00	21.75	21.00	18.00	18.50	17.50	15.50
October	14.87	12.46	10.10	13.75	15.88	29.00	29.00	24.50	40.50	17.00	22.50	19.60	17.50	18.50	17.13	15.50
November	15.00	12.00	9.50	14.05	18.88	31.25	29.00	27.75	36.40	17.20	20.50	17.75	17.88	18.50	16.60	15.50
December	15.50	12.00	10.00	15.63	22.38	32.40	28.00	30.50	26.00	16.63	20.00	19.50	19.20	18.50	16.50	15.50
Average	*13.73*	*13.52*	*11.28*	*12.47*	*16.98*	*28.93*	*29.17*	*24.30*	*38.48*	*18.42*	*18.13*	*22.18*	*18.20*	*18.16*	*17.22*	*15.67*

Metals, Tin Plate and Galvanized Sheets for Sixteen Years

Copper at New York, Cents a Pound (Lake Copper through 1919; Electrolytic Copper, 1920 to Date)

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	14.50	16.98	14.85	14.02	24.39	29.73	23.50	20.48	19.27	12.95	13.55	14.52	12.46	14.73	13.84	12.99
February	14.41	15.55	15.00	15.21	26.85	34.90	23.50	17.86	19.02	12.84	12.92	15.34	12.73	14.49	14.00	12.69
March	14.88	15.05	14.79	15.75	27.10	35.85	23.50	15.46	18.50	12.19	12.68	16.84	13.52	14.06	13.86	13.08
April	16.00	15.67	14.75	18.90	28.27	31.67	23.50	15.55	19.19	12.49	12.61	16.81	13.21	13.30	13.69	12.81
May	16.30	15.91	14.40	21.00	28.88	31.42	23.50	16.18	19.05	12.79	13.13	15.54	12.76	13.34	13.60	12.65
June	17.53	15.42	14.12	23.38	27.82	32.46	23.50	17.95	19.00	12.88	13.62	14.74	12.35	13.41	13.64	12.37
July	17.54	14.78	13.70	21.98	25.84	28.78	25.80	22.07	19.00	12.46	13.71	14.39	12.39	13.95	13.91	12.51
August	17.73	15.86	12.85	19.33	26.95	27.24	26.00	23.16	19.00	11.70	13.74	13.87	13.26	14.48	14.19	13.00
September	17.77	16.77	12.66	17.97	28.03	24.90	26.00	22.68	18.70	12.01	13.75	13.36	12.97	14.42	14.05	12.93
October	17.80	16.85	11.73	17.89	28.48	23.50	26.00	22.13	16.56	12.67	13.66	12.58	12.96	14.29	13.88	12.98
November	17.70	16.16	12.00	18.92	32.32	23.50	26.00	20.69	14.63	13.07	13.62	12.76	13.59	14.36	13.59	13.34
December	17.69	14.88	13.35	20.24	33.38	23.50	25.40	18.90	13.63	13.55	14.00	12.88	14.23	13.82	13.31	13.79
Average	*16.65*	*15.82*	*13.68*	*18.72*	*28.19*	*28.95*	*24.68*	*19.43*	*17.96*	*12.63*	*13.42*	*14.47*	*13.04*	*14.05*	*13.80*	*12.93*

Spelter (Zinc) at New York, Cents a Pound

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	6.52	7.15	5.29	6.59	18.19	9.94	7.88	7.38	9.62	5.83	5.06	7.28	6.78	8.10	8.75	7.03
February	6.71	6.45	5.40	8.84	20.13	10.48	7.99	6.70	9.14	5.36	4.85	7.58	7.11	7.86	8.16	7.04
March	6.98	6.26	5.28	9.29	18.40	10.77	7.64	6.52	8.93	5.20	5.00	8.19	6.85	7.68	7.69	7.06
April	6.86	5.77	5.18	11.22	18.58	9.85	7.01	6.51	8.63	5.24	5.25	7.65	6.49	7.35	7.36	6.69
May	6.86	5.47	5.06	16.14	15.86	9.46	7.32	6.46	8.08	5.28	5.45	6.99	6.13	7.30	7.16	6.43
June	6.99	5.18	5.09	22.18	12.75	9.62	8.01	6.93	7.92	4.95	5.69	6.40	6.14	7.35	7.47	6.57
July	7.26	5.38	5.02	20.58	9.83	8.95	8.69	7.90	8.18	4.77	6.12	6.43	6.25	7.60	7.76	6.58
August	7.19	5.75	5.60	14.11	8.98	8.69	8.96	7.84	8.31	4.69	6.59	6.68	6.53	7.55	7.69	6.70
September	7.53	5.82	5.50	14.16	8.22	8.34	9.60	7.57	7.82	4.74	6.91	6.81	6.54	8.12	7.76	6.56
October	7.57	5.42	4.97	13.96	9.98	8.24	9.11	7.83	7.51	5.10	7.20	6.66	6.67	8.65	7.66	6.35
November	7.48	5.29	5.12	17.15	11.90	7.95	8.70	8.14	6.84	5.18	7.48	6.70	7.14	9.04	7.56	6.09
December	7.33	5.18	5.71	16.69	11.13	7.84	8.45	8.59	6.00	5.25	7.46	6.60	7.73	8.97	7.39	6.15
Average	*7.11*	*5.76*	*5.27*	*14.24*	*13.66*	*9.18*	*8.28*	*7.36*	*8.08*	*5.13*	*6.09*	*7.00*	*6.70*	*7.96*	*7.70*	*6.60*

Lead, at New York, Cents a Pound

	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	4.41	4.35	4.11	3.74	5.93	7.69	6.87	5.56	8.67	5.00	4.70	7.85	8.31	10.26	9.25	7.59
February	4.00	4.35	4.06	3.82	6.23	9.13	7.04	5.05	8.88	4.54	4.70	8.14	9.01	9.38	9.08	7.40
March	4.08	4.35	3.97	4.04	7.43	9.47	7.24	5.23	9.21	4.08	4.71	8.47	9.23	8.90	8.46	7.57
April	4.20	4.40	3.82	4.20	7.73	9.43	6.95	5.03	8.95	4.33	5.13	8.19	8.19	8.01	7.91	7.10
May	4.20	4.37	3.90	4.25	7.45	11.00	6.88	5.05	8.55	4.99	5.51	7.39	7.27	8.08	7.75	6.60
June	4.50	4.35	3.90	5.89	6.87	11.68	7.55	5.34	8.48	4.56	5.73	7.14	7.08	8.35	8.08	6.42
July	4.67	4.37	3.90	5.59	6.34	10.72	8.04	5.65	8.67	4.40	5.75	6.28	7.15	8.33	8.60	6.33
August	4.54	4.64	3.87	4.68	6.26	10.72	8.05	5.77	8.98	4.40	5.88	6.74	8.02	9.52	8.96	6.69
September	5.04	4.73	3.86	4.62	6.88	8.84	8.05	6.12	8.11	4.60	6.20	7.06	8.09	9.60	8.80	6.30
October	5.06	4.52	3.52	4.60	7.00	6.77	8.05	6.45	7.24	4.70	6.67	6.84	8.31	9.62	8.40	6.25
November	4.66	4.33	3.68	5.16	7.13	6.44	8.05	6.76	6.33	4.70	7.20	6.87	8.96	9.84	8.00	6.27
December	4.32	4.06	3.80	5.33	7.60	6.48	6.71	7.03	4.80	4.70	7.28	7.61	9.61	9.36	7.87	6.52
Average	*4.47*	*4.40*	*3.87*	*4.66*	*6.90*	*9.03*	*7.46*	*5.76*	*8.07*	*4.58*	*5.79*	*7.39*	*8.27*	*9.10*	*8.39*	*6.75*

Straits Tin, at New York, Cents a Pound

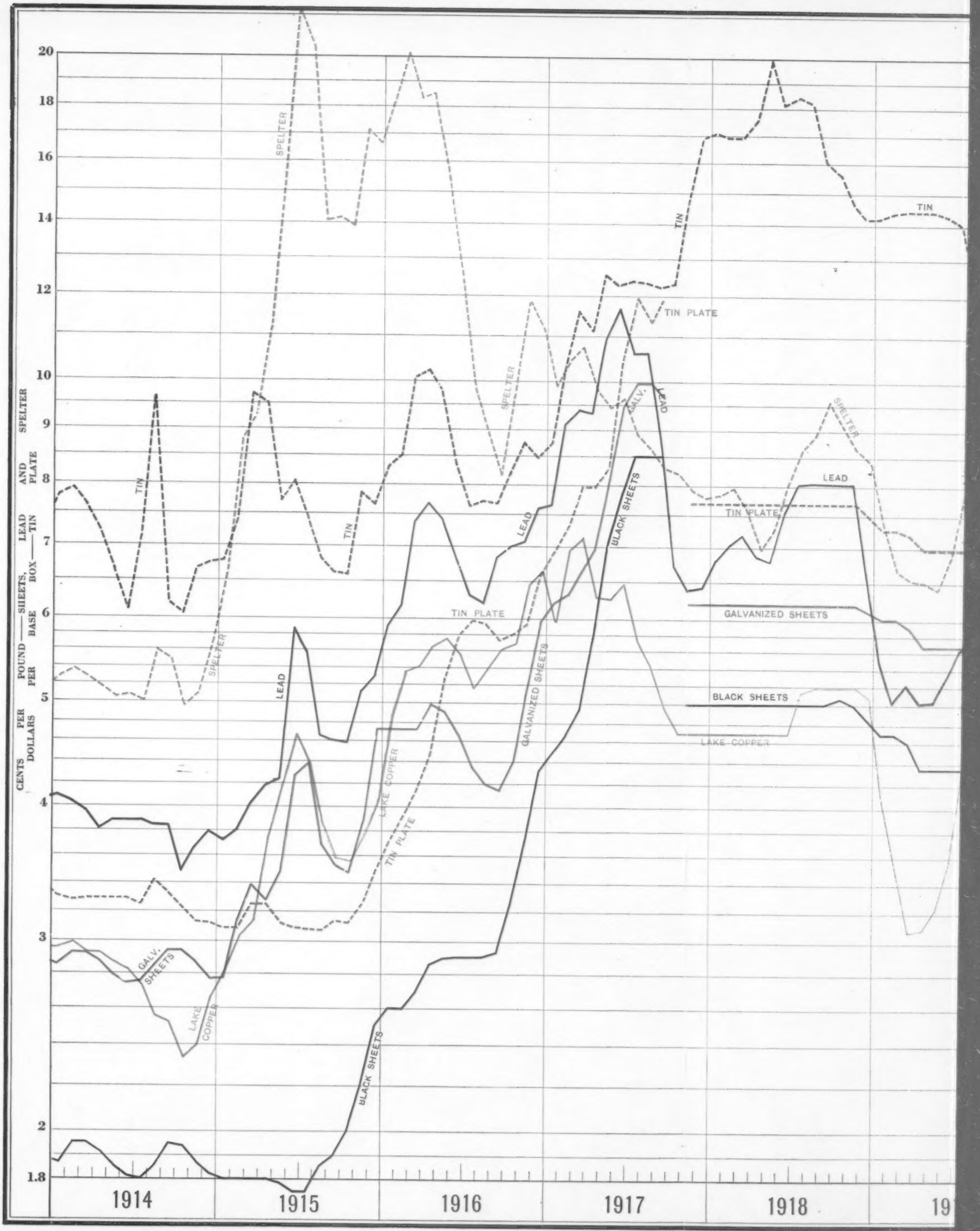
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	44.58	50.34	39.12	34.13	41.76	44.10	85.13	71.50	62.74	35.94	32.03	39.16	48.70	58.26	62.20	66.43
February	43.56	48.71	39.82	37.25	42.60	51.47	85.00	72.45	59.87	32.16	30.74	41.98	53.41	57.09	63.65	69.05
March	42.76	46.93	38.03	48.73	50.53	58.38	85.00	72.50	61.93	28.79	29.14	48.61	55.03	53.67	64.47	69.23
April	43.64	49.04	36.10	47.64	51.51	55.82	88.53	72.50	62.12	30.36	30.58	45.84	50.02	52.27	63.35	67.88
May	45.98	49.06	33.21	38.79	49.14	63.21	100.00	72.50	54.99	32.50	30.92	43.11	44.08	54.65	62.36	67.47
June	47.44	45.01	30.60	40.26	42.07	61.93	91.00	71.83	48.34	29.39	31.46	40.97	42.74	55.93	60.63	67.42
July	44.70	41.32	35.65	37.38	38.25	62.61	93.00	70.11	49.29	27.69	31.67	38.47	46.29	58.05	62.98	64.01
August	45.86	41.63	48.34	34.37	38.88	62.53	91.33	62.20	47.60	26.35	32.36	39.33	51.89	58.12	65.17	64.41
September	49.16	42.63	31.13	33.13	38.65	61.54	80.40	59.79	44.43	26.70	32.36	41.60	49.24	58.27	68.89	61.43
October	50.07	40.38	30.25	33.05	41.10	62.24	78.82	54.82	40.47	27.70	34.61	41.80	50.60	62.24	70.36	58.49
November	49.87	39.75	33.28	39.50	44.12	74.18	73.67	54.17	36.97	28.93	36.76	44.09	54.25	63.30	70.75	57.49
December	49.86	37.12	34.01	38.53	42.55	84.74	71.51	53.80	34.04	32.41	37.48	47.16	56.03	62.94	68.68	58.54
Average	*46.46*	*44.33*	*35.80*	*38.56*	*43.43*	*61.90*	*85.28*	*65.68*	*50.23*	*29.91*	*32.51*	*42.68*	*50.19*	*57.90*	*64.29*	*64.32*

Tin Plate, at Pittsburgh, Dollars a Base Box

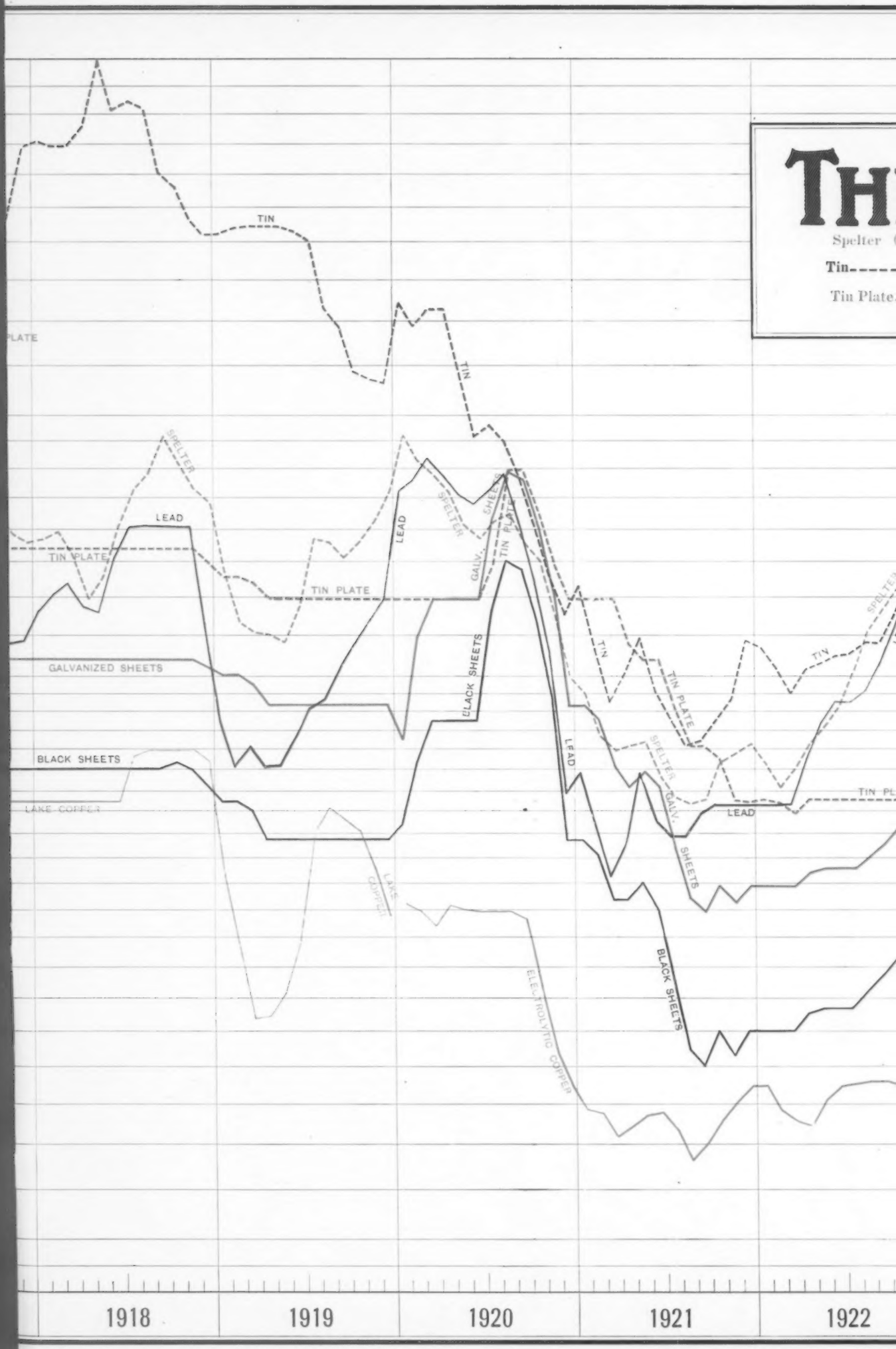
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	$3.40	$3.60	$3.32	$3.10	$3.75	$7.00	$7.75	$7.35	$7.00	$7.00	$4.75	$4.75	$5.50	$5.50	$5.50	$5.50
February	3.35	3.60	3.29	3.10	3.96	7.38	7.75	7.35	7.00	7.00	4.71	4.80	5.50	5.50	5.50	5.50
March	3.30	3.60	3.30	3.25	4.19	8.00	7.75	7.26	7.00	7.00	4.60	5.23	5.50	5.50	5.50	5.50
April	3.30	3.60	3.30	3.25	4.50	8.00	7.75	7.00	7.00	6.44	4.75	6.00	5.50	5.50	5.50	5.50
May	3.33	3.60	3.30	3.15	5.30	8.40	7.75	7.00	7.00	6.25	4.75	5.70	5.50	5.50	5.50	5.50
June	3.40	3.60	3.30	3.11	5.81	10.50	7.75	7.00	7.00	6.25	4.75	5.50	5.50	5.50	5.50	5.50
July	3.43	3.60	3.27	3.10	6.00	12.00	7.75	7.00	7.50	5.69	4.75	5.50	5.50	5.50	5.50	5.50
August	3.50	3.55	3.41	3.10	5.95	11.40	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50
September	3.58	3.50	3.35	3.15	5.75	12.00	7.75	7.00	9.00	5.25	4.75	5.50	5.50	5.50	5.50	5.50
October	3.60	3.50	3.24	3.15	5.81	....	7.75	7.00	8.33	5.13	4.75	5.50	5.50	5.50	5.50	5.50
November	3.60	3.40	3.15	3.28	5.97	7.75	7.75	7.00	7.50	4.75	4.75	5.50	5.50	5.50	5.50	5.50
December	3.60	3.40	3.13	3.52	6.63	7.75	7.55	7.00	7.00	4.73	4.75	5.50	5.50	5.50	5.50	5.25
Average	*3.45*	*3.55*	*3.28*	*3.19*	*5.30*	*9.11*	*7.73*	*7.08*	*7.53*	*5.90*	*4.73*	*5.42*	*5.50*	*5.50*	*5.50*	*5.48*

No. 28 Galvanized Sheets, at Pittsburgh, Cents a Pound

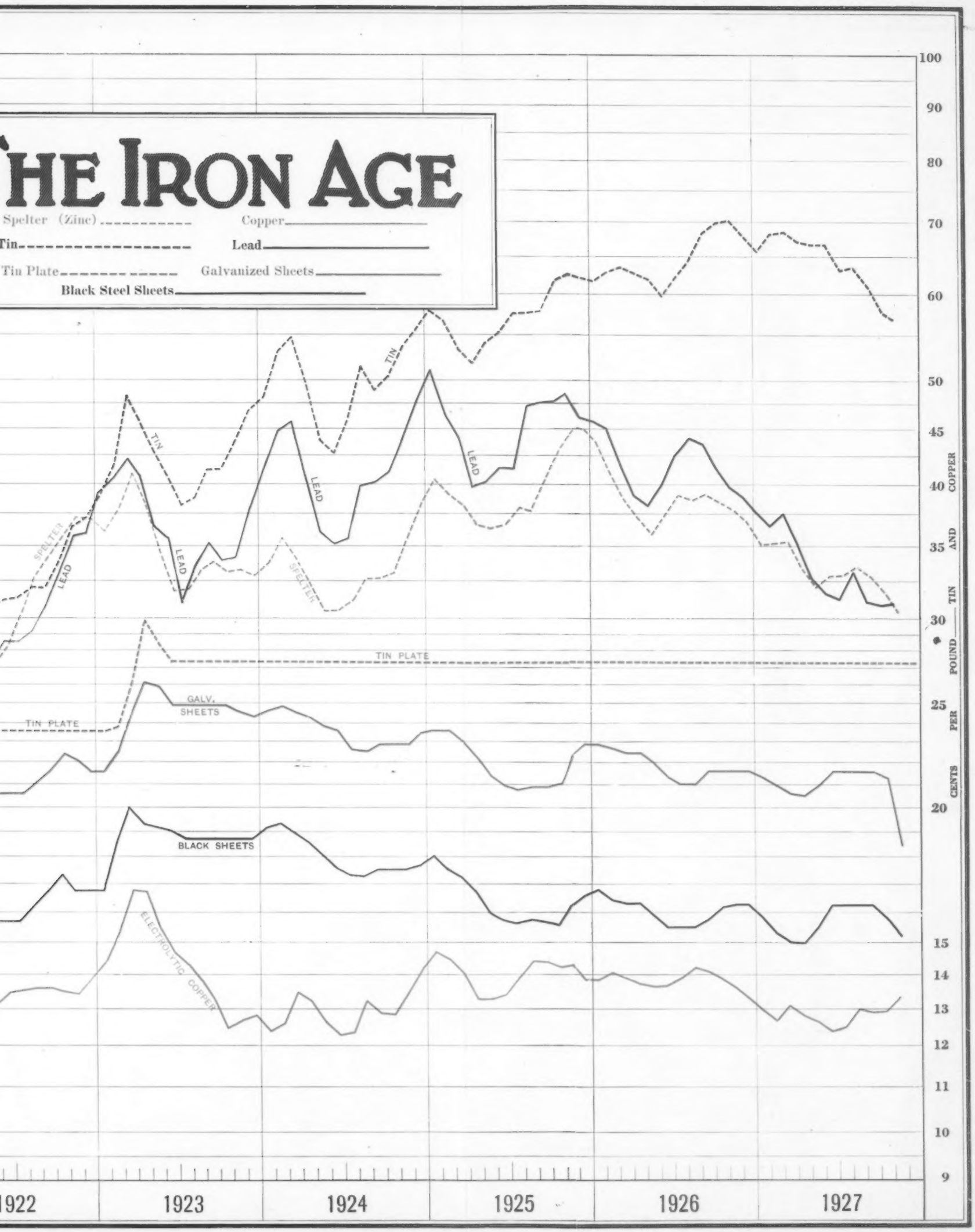
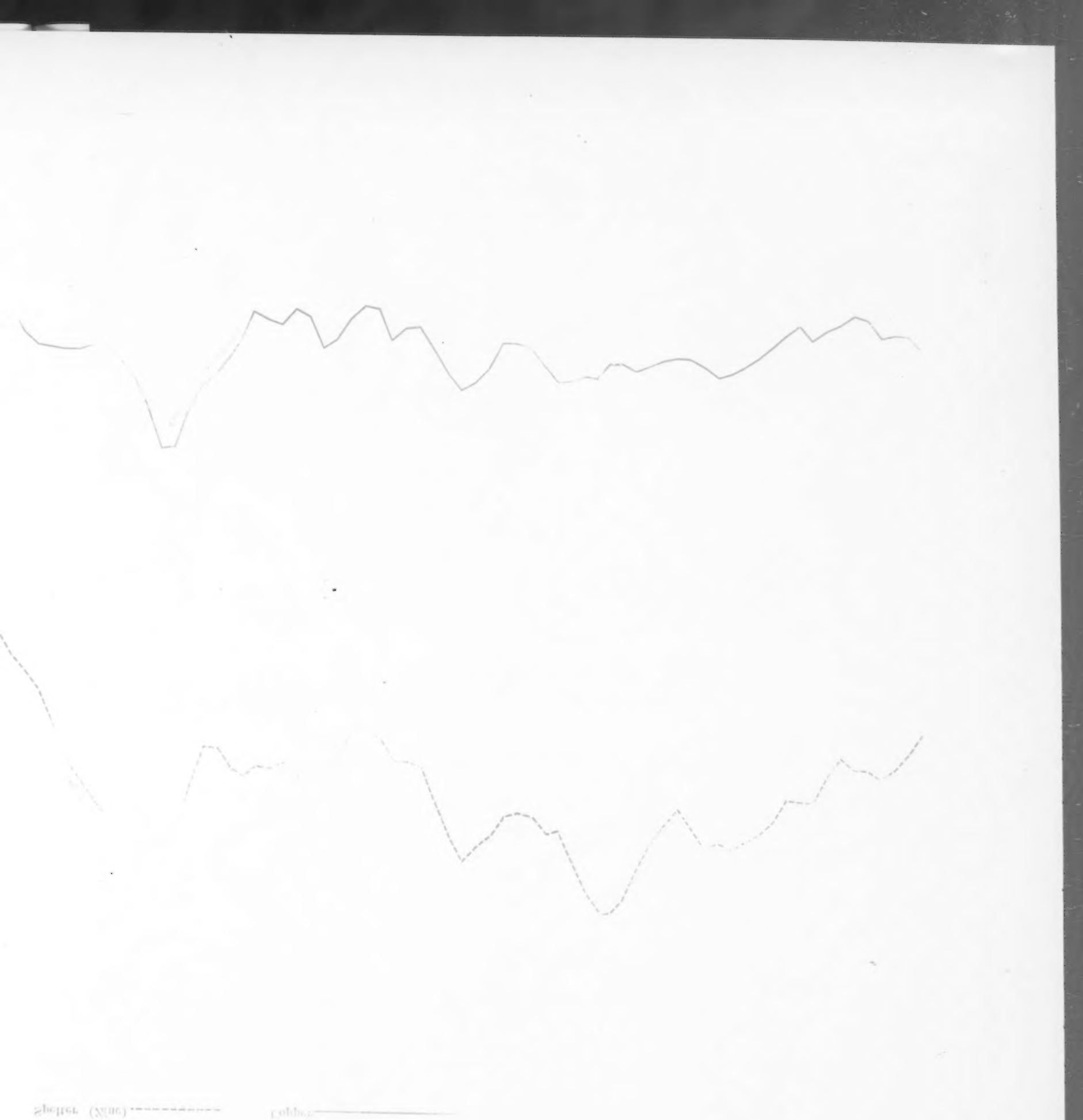
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
January	2.90	3.46	2.87	2.79	4.75	6.25	6.25	6.05	5.33	5.70	4.00	4.35	4.98	4.75	4.60	4.28
February	2.87	3.50	2.95	3.16	4.75	6.38	6.25	6.05	6.50	5.56	4.00	4.54	5.00	4.75	4.53	4.21
March	2.80	3.50	2.95	3.40	4.75	6.69	6.25	5.96	7.00	5.05	4.00	4.93	4.93	4.62	4.50	4.15
April	2.86	3.50	2.91	3.29	5.00	7.00	6.25	5.70	7.00	4.88	4.11	5.25	4.88	4.45	4.50	4.13
May	2.90	3.42	2.80	3.50	4.94	8.20	6.25	5.70	7.00	5.00	4.15	5.20	4.80	4.29	4.43	4.22
June	2.90	3.38	2.75	4.28	4.69	9.50	6.25	5.70	7.00	4.88	4.15	5.00	4.76	4.21	4.28	4.35
July	3.00	3.33	2.75	4.40	4.38	10.00	6.25	5.70	8.25	4.31	4.15	5.00	4.56	4.19	4.24	4.35
August	3.12	3.24	2.85	3.71	4.21	10.00	6.25	5.70	9.00	3.90	4.23	5.00	4.55	4.20	4.23	4.35
September	3.21	3.16	2.95	3.56	4.18	9.75	6.25	5.70	8.88	3.81	4.35	5.00	4.60	4.20	4.33	4.35
October	3.36	3.08	2.95	3.50	4.41	....	6.25	5.70	8.18	4.00	4.50	5.00	4.60	4.23	4.35	4.26
November	3.40	2.98	2.88	3.89	5.18	6.25	6.25	5.70	7.04	3.86	4.43	4.93	4.60	4.50	4.35	4.16
December	3.40	2.90	2.78	4.75	6.00	6.25	6.15	5.70	5.70	4.00	4.35	4.89	4.72	4.60	4.35	4.13
Average	*3.06*	*3.29*	*2.87*	*3.69*	*4.77*	*7.84*	*6.24*	*5.78*	*7.24*	*4.58*	*4.20*	*4.92*	*4.75*	*4.42*	*4.39*	*4.25*



Carload Prices of Copper, Lead, Tin and Z



Copper, Lead, Tin and Zinc in New York, and of Tin Plate and Black



Black and Galvanized Sheets in Pittsburgh